

# The genus *Pavetta* L. (Rubiaceae) in Australia

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## Summary

Reynolds, S.T. (1993). The genus *Pavetta* L. (Rubiaceae) in Australia. *Austrobaileya* 4(1): 21–49. The genus *Pavetta* L. in Australia is revised; ten species and four varieties are recognised, *P. conferta*, *P. kimberleyana*, *P. rupicola*, *P. speciosa*, *P. tenella*, *P. vaga*, *P. australiensis* var. *pubigera*, and *P. brownii* var. *glabrata* are new. All taxa recognised are described, and notes on their diagnostic features, affinities and geographical distribution given. Keys to these taxa and distributional maps of them are provided.

*P. modesta* Bremek. is synonymised under *P. granitica* Bremek.; *P. insulana* Bremek. under *P. brownii* Bremek.; *P. brownii* var. *pubescens* Bremek. and *P. brownii* var. *glabra* Bremek. under *P. brownii* var. *brownii*. Specimens previously identified as *P. brownii* var. *glabra* are included under *P. brownii* var. *glabrata*. A lectotype is chosen for *P. brownii* Bremek.

Keywords: *Pavetta* – Australia, *Pavetta conferta*, *Pavetta kimberleyana*, *Pavetta rupicola*, *Pavetta speciosa*, *Pavetta tenella*, *Pavetta vaga*, *Pavetta australiensis* var. *pubigera*, *Pavetta brownii* var. *glabrata*.

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## Introduction

The genus *Pavetta* L. in Australia is extremely complex, and the identification of most of its species has been very difficult and problematic, mainly because most of the species resemble each other closely especially in their inflorescence and fruit characters. Moreover many species were poorly known and poorly represented or represented by incomplete material (leaves immature on flowering specimens). In most cases it was found that only a few specimens appear to belong together, and with a limited amount of material it was difficult to ascertain the variations and exceptions within the species. One species, viz *P. insulana* Bremek. was not represented at all in Australian herbaria (type at L).

Bentham (1867), who followed Lamarck (1789) by referring *Pavetta* L. to a section under the genus *Ixora* L., recognised two species from Australia which he considered to be the same as two Indian species, viz *Ixora pavetta* Roxb. and *Ixora tomentosa* Roxb.

Bremekamp (1934), however, considered the Australian plants to be quite distinct from the above Indian species (which according to

him are restricted to South East Asia). He recognised and described six species from Australia (1934, 1939), viz *P. australiensis*, *P. brownii*, *P. granitica*, *P. insulana*, *P. modesta* and *P. muelleri*, which he considered all new and endemic to Australia. Because his treatment is mostly regional, the relationship of these species with the Indian and other species from outside Australia (especially New Guinea) is not known. With the exception of *P. australiensis* and *P. brownii*, all his other species were known only from their types. As more material became available, the differentiating characters he used in his key to separate the species were found to be unreliable, because the characters were found to vary not only in different samples of the same species but also within the same individual. Therefore it was extremely difficult to delimit some of the species and misidentification was frequent in Australian herbaria. Most species were in a confused state; similar specimens were found filed under different names; different looking specimens were filed under the same name, while some were still filed under *P. indica* and *P. tomentosa*. Increased collectings also exhibited an increased range of variability of some of the species viz *P. australiensis* and *P. brownii*, making them very difficult to circumscribe.

Although increased collectings in recent years have added to the number of representative specimens of many of the species, and enabled description of the new species, some species are still poorly known. Also there are a few unknown collections which cannot be placed with certainty in any of the recognised taxa. All these require further collectings.

Ten species are recognised here: six of these are new; four of the species recognised by Bremekamp are retained, viz *P. australiensis*, *P. brownii*, *P. granitica* and *P. muelleri*; two of his species are placed in synonymy, viz *P. insulana* Bremek. under *P. brownii* Bremek., and *P. modesta* Bremek. under *P. granitica* Bremek. Although the species recognised here are quite variable, or forms resemble each other closely, they are nevertheless, quite distinctive. However the relationship and status of some of the species may probably change as more material becomes available.

Some of the Australian species, viz *P. australiensis* Bremek. and *P. tenella* S.T. Reynolds closely resemble *P. platyclada* Lauterb. et K. Schum. from New Guinea, *P. opulina* (J.R. Forst.) DC. from New Caledonia and *P. moluccana* Bremek. from Timor, and the species are no doubt closely related. But specimens available for study of these offshore species are too few for a comparative study, and an assessment of their relationship must await revisionary studies of *Pavetta* L. for this whole area.

**Conservation status:** Although most species are poorly represented in herbaria (mainly because some species occur only in remote areas), none of the Australian species of *Pavetta* appear to be rare or threatened.

**Note:** This study is based mostly on herbarium material. The measurements of leaves and inflorescence axes are based on dried material, while those of flowers are from fresh material or material reconstituted by boiling in water.

This revision of *Pavetta* L. is part of the 'Revision of the tribe *Pavetteae* Dumort in Australia', funded by the Australian Biological Resources Study. A revision of the remainder of the tribe will be published later.

## Taxonomy

**Pavetta** L. Sp. Pl. 1: 110 (May 1753). **Type:**

*Pavetta indica* L.

Bremekamp, Feddes Repert. 37: 1–208 (1934), op. cit. 47: 12, 26, 27 (1939); Bridson, Kew Bulletin 32(3): 609–652 (1978).

*Ixora* sect. *Pavetta* (L.) Benth., Fl. austral. 3: 414–415 (1867, '1866')

**Derivation of name:** from 'Pawatta', a Sinhalese name for *P. indica* L.

Deciduous shrubs or small trees. Leaves immature or absent at time of flowering, usually clustered at apex of branchlets, opposite, membranous to slightly coriaceous, usually drying blackish, mostly obscurely dotted, sometimes with bacterial galls in the lamina; petiolate; stipules united into an interpetiolar oblique sheath, truncate or with subulate long-aristate lobes, or with ovate or triangular, cuspidate or aristate lobes, prominently keeled, mostly with silky colleters on the inside (at base). Inflorescences terminal on main or lateral leafy or leafless branchlets (flowering branchlets), loosely trichotomous, usually sessile above the last pair of leaves; branches corymbiform, usually many-flowered; central branch with one to few, usually short internodes, mostly with a few pairs of small deciduous leaves distal to first internode (usually absent on fruiting specimens); lateral branches mostly with one internode; bracts sheathing young inflorescences large, stipular; those subtending the trichotomous branches of the inflorescences (usually lower corymbiform branches) connate, conspicuous, usually ± membranous, while those at base of cymules small and usually subulate; bracteoles inconspicuous or absent; peduncle-like flowering branchlets (subtending the inflorescence) usually long, and covered with thin smooth corky flaky bark. Flowers bisexual, 4-merous; pedicellate. Calyx usually with a short tube, and shorter, flared, mostly membranous, denticulate limb (Australian species); calyx tube turbinate or campanulate, glabrous or hairy outside, glabrous inside; limb with a short tube and with tiny lobes at flared apex; calyx lobes ovate, triangular to subulate, keeled or not. Corolla white,

fragrant, tube cylindrical, slender, usually slightly dilated at the throat, glabrous or pilose outside; usually pilose inside at throat; corolla lobes shorter than the tube, contorted in bud, lanceolate or elliptic, apiculate, reflexed. Stamens inserted at mouth of the corolla tube, subsessile, filaments shorter than anthers; anthers dorsifixed near its base, linear, acuminate with a prolonged connective at apex, sagittate at base, exserted, usually reflexed, twisted at anthesis. Disc annular, fleshy. Ovary 2-locular, ovules solitary in each locule, slightly immersed in fleshy ± cupular placenta; style slender, thickened in the upper part, long-exserted, exserted portion much longer than corolla lobes; stigma club-shaped, bifid, ribbed, papillate or shortly hairy. Fruit a drupe, globose, crowned by persistent calyx lobes, mostly drying black and shiny; pyrenes 1 or 2, thin-walled. Seeds 2 or 1 (by abortion), attached to the centre of septum, subglobose or hemispherical, convex on dorsal face, and usually rugose, ± concave and with a wide circular excavation in the centre on the

ventral face; testa thin; endosperm entire; embryo dorsal, small, curved.

About 400 species (Mabberley 1989) in Old World tropics, from Africa to South East Asia, New Guinea, Australia, New Caledonia and Vanuatu. Ten species in Australia, six new.

The genus *Pavetta* L. is characterised by its corymbiform inflorescences terminal on long peduncle-like leafy or leafless branchlets, connate bracts at the junction of the trichotomously branched inflorescences, and by its white, 4-merous flowers, with long exserted style and fusiform bifid stigma.

It is easily distinguished from other members of the tribe *Pavetteae* Dumort in Australia, *Ixora* L. and *Tarenna* Gaertner, chiefly by the conspicuous connate bracts at the base of the trichotomous branches of the inflorescence. The bracts are free in the latter genera.

The genera *Pavetta* L. and *Ixora* L., which have sometimes been combined, may be distinguished as follows.

1. Bracts connate at base of trichotomous branches of the inflorescence, and usually membranous; branches of inflorescence not articulated; stigma inconspicuously 2-fid; flowers drying very pale brown or blackish; leaves deciduous, ± membranous or slightly coriaceous, hairy or glabrous; stipules united into an interpetiolar sheath, truncate or with prominent cuspidate lobes. . . . . **Pavetta**
- Bracts free, ± coriaceous; branches of inflorescence articulated; stigma with 2 recurved lobes, flowers drying ± reddish (wine-coloured); leaves not deciduous, usually coriaceous, glabrous; stipules usually very shortly united at base, and with cuspidate or aristate lobes. . . . . **Ixora**

The genus *Pavetta* L. was divided by Bremekamp (1934) into subgenera, sections and series. The Australian species are referable to subgenus *Pavetta* 'eupavetta', section *Pavettaster* Bremek. and series *Austro-orientales* Bremek.

**Notes:** In the following key to species, the nature of the hairs on the calyx (of opened flowers but not buds) and the leaves are used to distinguish most of the species. Because most species (except *P. australiensis*) are poorly represented in herbaria, or represented by in-

complete material (mostly because the leaves are deciduous and therefore absent or immature when flowering material is collected), sets of characters are provided to help distinguish the species.

In the descriptions, the length of the flowering branchlet is actually that of the peduncle-like long stalk subtending the trichotomously branched corymbiform inflorescences, and the measurement of the inflorescence comprises the three corymbiform branches from apex of peduncle-like stalk.

### Key to the Species

1. Leaves and inflorescence glabrous (very rarely with a few scattered hairs on inflorescence axes and calyx) ..... 2  
 Leaves hairy all over the surface or the hairs restricted to midrib and nerves  
 Inflorescence hairy ..... 4
2. Leaves 0.8–2.5(–3.2) cm wide; petioles 2–10(–16) mm long; midrib conspicuously raised on lower surfaces; inflorescences compact with short branches; pedicels 1–4 mm long; calyx distinctly toothed ..... **2. P. granitica**  
 Leaves (2.0–)4.0–8.0(–9.2) cm wide; petioles (7–)12–22 mm long; midrib not conspicuously raised on lower surfaces; inflorescences open with long branches; pedicels 4.5–12.0 mm long; calyx indistinctly toothed ..... 3
3. Leaves 5.5–15.0 × 2.0–6.2 cm, elliptic, lanceolate or oblanceolate, apex acute, acuminate or subobtusate; texture thin; corolla tube (7–)12–17 mm long ..... **1. P. australiensis**  
 Leaves 7.5–21.0 × 3.5–9.2 cm, elliptic, elliptic-oblong or ± obovate, apex obtuse or subacute, rarely shortly acuminate or ± rounded; texture ± coriaceous; corolla tube 6–9(–11) mm long ..... **5. P. brownii**
4. Leaves 0.8–2.5(–3.2) cm wide, attenuate into short petiole; both surfaces hairy; petioles 2–10(–16) mm long; inflorescence usually compacted; pedicels 1–4 mm long; calyx distinctly toothed, appressed hairy; corolla tube (8–)12–14 mm long ..... **2. P. granitica**  
 Leaves usually more than 3.5 cm wide, if less then not with above combination of characters ..... 5
5. Leaves very thin in texture, apex prominently acuminate or acute; lower surfaces of leaves and inflorescences very finely hairy ..... **1. P. australiensis**  
 Leaves usually ± coriaceous, apex obtuse, ± rounded, acute, subacute or rarely shortly acuminate at apex; both surfaces of leaves and inflorescences finely hairy, or leaves hairy only on lower surfaces, or only on the midrib and nerves ..... 6
6. Hairs on calyx tube usually straight and patent ..... 7  
 Hairs on calyx tube usually curved, antrorsely curved or appressed, rarely hairs ± spreading ..... 9
7. Leaves and flowers on short stalks; petioles 0.5–1.0 cm long; pedicels 2–4 mm long; leaves 1.5–5.5 cm wide, both surfaces hairy, dries very pale brown or yellow-brown with paler nerves; lateral corymbs 9–14-flowered ..... **6. P. rupicola**  
 Leaves and flowers on long stalks; petioles 0.8–4.0 cm long; pedicels (4.5–)6–13 mm long; leaves (3.5–)4.5–10.0 cm wide; both surfaces hairy or hairy only on the midrib and nerves, dries brown, olive-brown or infused with black, with whitish or blackish nerves; lateral corymbs (7–)11–34-flowered ..... 8

8. Petioles 0.8–1.7(–2.2) cm long; leaves 7.5–15.5(–21) × (3.5–)4.5–8.0 (–9.2) cm; internode of lateral branches of inflorescence (6–) 11–20 mm long; calyx lobes 0.3–0.5 mm long; corolla tube 6–11 mm long, corolla lobes 4.5–6.0 mm long; leaves and inflorescence usually dries blackish or infused with black ..... **5. *P. brownii***
- Petioles (1.6–)2.7–4.0 cm long; leaves (12.0–)17.0–24.5 × (4.7–)5.5–10.0 cm; internode of lateral branches of inflorescence (6–)20–40 mm long; calyx lobes 0.7–1.0 mm long; corolla tubes (8–)10–13 mm long; corolla lobes 5.5–6.5 mm long; leaves and inflorescence very rarely dry infused with black ..... **7. *P. tenella***
9. Leaves hairy on both surfaces ..... 10  
 Leaves glabrous on upper surfaces, but hairy on lower surfaces, or hairy only on the midrib of both surfaces ..... 13
10. Lower surface of leaves densely hairy, upper ones with dense or sparse persistent hairs; calyx with appressed hairs ..... 11  
 Both surfaces of leaves sparsely hairy; calyx with antrorsely curved, appressed or ± spreading hairs ..... 12
11. Pedicels usually unequal in length in a cymule; fruiting pedicels 3–8 mm long; petioles 0.5–2.5 cm long; internodes of central branch of inflorescence 5–10 mm long; calyx tube and usually limb, with dense, slightly curly appressed hairs; corolla tube (4–)7–10 mm long; leaves usually glossy on upper surface, dries brown or reddish brown with reddish or whitish nerves; lateral nerves 12–14 pairs ..... **3. *P. muelleri***
- Pedicels usually equal in length in a cymule; fruiting pedicels (7–) 10–20 mm long; petioles (1.2–)2.4–3.5 cm long; internodes of central branch of inflorescence (6–)12–17 mm long; calyx tube with moderately sparse, short, ± curved, appressed hairs, hairs sparser on limb; corolla tube 9–11(–15) mm long; leaves ± shiny or slightly dull on upper surface, dries pale brown, yellowish-brown to olive-brown, with whitish or pale yellow nerves; lateral nerves 9–11(–13) pairs ... **4. *P. kimberleyana***
12. Inflorescences compact, depressed from top and with short lateral branches (internodes of central branch 3–5(–7) mm long, that of lateral branch 2–7(–12) mm long); connate bracts finely hairy outside; calyx tube usually with appressed or antrorsely curved hairs; corolla tube 7–11(–13) mm long, glabrous outside; stipules connate below middle, with broadly ovate lobes ..... **9. *P. conferta***
- Inflorescences open with long branches (internodes of central branch 5–15 mm long, that of lateral branch 20–30 mm long); connate bracts ± velutinous outside; calyx tube with antrorsely curved or ± spreading hairs; corolla tube 12–14 mm long, usually pilose outside; stipules united nearly the whole length forming a long sheath, truncate or with small ovate lobes ..... **10. *P. vaga***

13. Leaves and fruits on long stalks; petioles (1.2–)2.4–4.0 cm long; fruiting pedicels (7–)10–20 mm long; lateral branch of inflorescence with (6–)10–40 mm long internode; calyx distinctly toothed, tube appressed hairy; leaves (6.0–)8.5–25.0 × (2.5–)5.5–10.0 cm . . . . . 14
- Leaves and fruits on moderately short stalks; petioles 0.8–2.2 cm long; fruiting pedicels 8–14 mm long; lateral branch of inflorescence with (6–)8–20 mm long internode; calyx with or without distinct teeth, tube with appressed or antrorsely curved hairs; leaves (6.0–)9.0–15.5 (–21.0) × 3.5–8.0(–9.2) cm . . . . . 15
14. Petioles (1.2–)2.4–3.5 cm long; pedicels 2.5–4.5(–10.0) mm long (in fruit (7–)10–20 mm long); internode of lateral branch of inflorescence 10–27 mm long; corolla tube 9–11(–15) mm long; leaves (6.0–)8.5–18.5(–25.0) × (2.5–)5.5–7.0(–8.5) cm, elliptic, broadly lanceolate or subobovate, apex obtuse, ± rounded or subacute . . . . . **4. P. kimberleyana**
- Petioles (1.6–)2.7–4.0 cm long; pedicels (6–)10–13 mm long (in fruit (8–)12–15 mm long); internode of lateral branch of inflorescence (6–)20–40 mm long; corolla tube (8–)10–13 mm long; leaves (12.0–)17.0–24.5 × (4.7–)5.5–10.0 cm, elliptic, abruptly narrow at both ends, apex obtuse or abruptly shortly acuminate . . . . . **7. P. tenella**
15. Inflorescences large, densely flowered with showy large flowers; branches short (internodes of central branch 5–8 mm long, that of lateral branch 6–11 mm long); corolla tube (9–)12–16 mm long, gradually dilated to apex, pilose outside; corolla lobes 6.5–7.0 mm long; calyx distinctly toothed; leaves obovate to elliptic; lateral nerves oblique or arcuate, (9–)12–18-paired . . . . . **8. P. speciosa**
- Not with above combination of characters; inflorescence branches usually long (internodes of central branch 5–15(–30) mm long, that of lateral branch (6–)11–20 mm long); corolla tubes 6–9(–11) mm long, slender or dilated towards apex, glabrous outside; corolla lobes 4.5–6.0 mm long; calyx indistinctly toothed; leaves elliptic, elliptic-oblong or rarely ± obovate; lateral nerves patent or ± oblique, 8–10-paired . . . . . **5. P. brownii**
- 1. Pavetta australiensis** Bremek., Feddes Repert. 37: 124 (1934). **Type:** Queensland: COOK DISTRICT: Cape York, 12 November 1849, *J. Macgillivray* s.n. (holo: K!).
- [*Ixora pavetta* auct. non Roxb.: Benth., Fl. austral. 3: 414 (1867 '1866'): F. Muell., 1st Census 74 (1882)].
- [*Pavetta indica* auct. non L.: F. Muell., Fragm. 9: 182 (1875); Bailey, Synopsis. Qd Fl. 227 (1883), & Qd Fl. 3: 766 (1900); Ewart & Davies, Fl. Northern Territory 258 (1917); Domin, Biblioth. Bot. 89: 623 (1928) as *P. indica* var. *typica* nom. inval.]
- Shrubs or small trees 2–5 m high; bark grey; all parts glabrous, or tips of branchlets, leaves and inflorescence finely hairy. Leaves usually clustered at tips of branchlets, elliptic, narrowly elliptic, narrowly oblanceolate-acuminate to lanceolate, (5.5–)8.0–15.0 × (2.0–)4.0–6.2 cm; apex abruptly acuminate (acumen long or short), acute or ± obtuse, mucronate, base ± obtuse or acute, occasionally abruptly acute and attenuate into petiole; texture thin (very thin when dry and slightly membranous); glabrous or lower surfaces finely hairy with pale or brown hairs, or only midribs hairy; dries pale olive-green to darkish brown or blackish with black, reddish or whitish nerves; midrib usually ± sunken towards the base on upper surfaces, raised below,

dries whitish or blackish; lateral nerves very thin, widely spaced, 6–9(–12) pairs, slightly oblique, erect or arcuate; reticulate venation very fine; petioles (0.7–)1.7–2.2 cm long, hairy or glabrous. Stipules at apex of branchlets ovoid-globose, acuminate, those on branchlets connate to above the middle and usually forming an oblique sheath, slightly truncate, or with ovate, aristate, conspicuously keeled lobes, ± membranous, dries very pale brown, glabrous or puberulous outside, usually with sparse long colleters inside (at base). Stipular bracts sheathing young inflorescences broadly ovate, ± membranous, dries pinkish-brown. Inflorescence bearing branchlets 3.5–19.5 cm long, with pale or reddish brown papery peeling bark; inflorescences one to few clustered at tips of branchlets, 2.5–9.5 × 5.0–12.0 cm, laxly corymbose, central branch with (1), 2 or 3 internodes, these (3–)7–28 mm long; lateral branches with (6–)11–35 mm long internode, and (8–)17–29-flowered corymbs; peduncles glabrous, rarely with a few antrorsely curved hairs; connate bracts broadly ovate, cuspidate, membranous, glabrous or puberulous outside, 8–10 × 6–8 mm. Pedicels 5–10 mm long (in fruit (8–)13–16 mm long), glabrous or puberulous; calyx with a slightly flared, short, pale ± membranous limb, indistinctly toothed, 1.5–2.5 × 1.0–2.2 mm, glabrous

or with fine, antrorsely curved or appressed hairs on the tube; limb about one third the length of the tube, glabrous; calyx lobes minute, about 0.5 mm long, narrowly triangular or subulate, keeled, glabrous or with a few hairs at apex; corolla tube slender, dilated towards the mouth, (7–)12–17 mm long, 1.0–1.5 mm wide at base, 1.5–2.5 mm wide at top, usually pilose at throat; corolla lobes about half as long as the tube, (5–)6–8 × 2–3 mm, elliptic or lanceolate, obtuse or subacute; anthers 3.5–5.0 mm long; styles 2.5–3.5 mm long. Fruits 5–9 × 5–7 mm; seeds subglobose, 4–6 × 4–6 mm.

**Diagnostic features:** *P. australiensis* is distinguishable by its thin, glabrous or hairy, elliptic or lanceolate, acuminate, subacute or obtuse leaves; its few lateral nerves; obliquely ovate thin stipules; usually many-flowered, laxly corymbose, glabrous or hairy inflorescences; its slender pedicels, long corolla tubes, and by its large, thin, oblique, usually persistent bracts on young inflorescences.

This species is very variable in the shape and size of leaves and inflorescence, in the length of corolla tube and the degree of hairiness. Two varieties are separated here as follows.

1. Leaves and inflorescence glabrous (very rarely with a few scattered hairs) . . . . . var. **australiensis**  
Lower surface of leaves and inflorescence finely hairy . . . . . var. **pubigera**

***P. australiensis* Bremek. var. *australiensis***

Distinguishing characters are as indicated in the key above.

**Representative specimens:** Queensland. COOK DISTRICT: Cape York, Mar 1868, *Daemel* s.n. (K, MEL); 4.5 km from Watson River Crossing on the Aurukun-Merluna road, about 40 km NE of Aurukun, Dec 1981, *Clarkson* 4060 (BRI); Round Mountain, Embley Range (13°33' S, 143°30' E), Jun 1992, *Forster* 10468 (BRI); \*Silver Valley (17°27' S, 145°15' E), Dec 1976, *Gray* 9 (QRS). \* Mt Molloy, Apr 1932, *Brass* s.n. (BRI). BURKE DISTRICT: \*\* Karumba, Aug 1943, *Blake* 15135 (BRI, MEL); NORTH KENNEDY DISTRICT: Murray River, Oct 1867, *Dallachy* s.n. (MEL 1554006); \*Townsville, Dec 1961, *Kennedy* s.n. (BRI); Conway road about 0.5 km N of Conway beach, about 30 km E of Proserpine, Nov 1985, *Sharp* 4001 & *Batianoff* (BRI). SOUTH KENNEDY DISTRICT: Port Mackay, 1863, *Dietrich*

1836 (CANB). PORT CURTIS DISTRICT: Keppel and Shoal Bay, *Brown* 3447 (BM), and 3448 (BM, CANB, NSW). LEICHHARDT DISTRICT: Lake Elphinstone area, Feb 1987, *Champion* 217 (BRI). BURNETT DISTRICT: S of Cania Gorge National Park, about 20 km NNW of Monto, Oct 1983, *Henderson* 2984, *Guymer & Dillewaard* (BRI, CANB). MORETON DISTRICT: Brisbane River, date unknown, *Mueller* (K, MEL); ditto, Sep 1820, *Cunningham* 105 (K), ditto, Sep 1827, *Cunningham* 562 (BM, K). New South Wales. Tweed River, date unknown, *Eaves* s.n. (MEL 1553987); Kyogle, May 1947, *Hayes* s.n. (NSW).

**Distribution and habitat:** Eastern Australia, chiefly coastal, from Cape York Peninsula, Queensland, to northern New South Wales; usually as an understorey tree in fringing forests along creeks and rivers, in dry scrubs, coastal forests, beach ridges, and hillsides. **Map 1.**

**Notes:** This variety consists of several forms varying especially in the form of the leaves and inflorescences. These forms are not formally recognised here because they are connected by intermediate forms or they are poorly known. However, two of these forms, from north and northwestern Queensland, both with narrow leaves, are rather distinctive and probably worthy of recognition, but there are not enough specimens available of them to establish whether they are consistently different.

The form from north Queensland (\**Brass* s.n.; \**Gray* 9; and \**Kennedy* s.n.) has narrow leaves (2–4 cm wide), long pedicels (about 10 mm long) and long corolla tubes (13–17 mm long). The one from northwestern Queensland, viz \*\**Blake* 15135 from Karumba, has narrow, elliptic ± falcate leaves, 8.5–13.0 × 1.9–2.8 cm, with acute or subacute apex, and is acute and decurrent into long prominent petiole at base; the midrib dries very pale yellow and is very prominently raised on lower surfaces and continuous with the very pale yellow, long, thick petiole, lateral nerves obscure; the petioles are 1.7–2.3 cm long; the inflorescences (immature) have short branches 5–7 mm long, the pedicels are 2–4 mm long, and the corolla tubes about 8 mm long. This form has the aspect of both *P. australiensis* and *P. granitica* and is probably distinct from both these species, but until more collections from this area are seen, it is tentatively included under the former species because in most features it appears to agree more with this species.

**Affinities:** Some forms of *P. australiensis* var. *australiensis* resemble *P. opulina* (J.R. Forst.) DC. from New Caledonia, as represented by specimens under that name at BRI. They are also comparable with the type of the latter species name, viz *Forster* s.n. (K!). The species are probably closely related, but because only a few specimens of *P. opulina* were seen in this study, it has not been possible to assess its variability and relationship to *P. australiensis* at this time.

***P. australiensis* var. *pubigera*** S.T. Reynolds  
**var. nov.** *P. australiensis* var. *australiensis*  
similis autem foliis inflorescentisque  
pubescentibus differt. **Typus:** Queensland.

COOK DISTRICT: Gap Creek about 22 miles [34.2 km] S by E of Cooktown, altitude 300 m, 19 May 1969, *Smith* s.n. (holo: BRI (AQ 377111); iso: CANB).

Distinguishing characters of this variety are as indicated in the key above. The leaves are usually abruptly and conspicuously acuminate (mostly with a moderately long acumen) or acute at apex, and the corolla tubes are mostly shorter (7–12 mm long) than those of the typical variety.

**Specimens examined: Queensland.** COOK DISTRICT: Timber Reserve 114, Kewteven, McIlwraith Range (13°43'S, 143°19'E), Mar 1982, *Hyland* 11766 (BRI, QRS); 16 km along road to Leo Creek Mine, McIlwraith Range (13°42'S, 143°13'E), Jun 1992, *Forster* 10094 (BRI); Gap Creek, Aug 1973, *Moriarty* 1416 (CANB); Bloomfield near Hopedale, Sep 1960, *Smith* 11102 (BRI, CANB); Palmerston National Park, about 1.6 km S of highway, 32 km WSW of Innisfail, Sep 1960, *Smith* 11272 (BRI).

**Distribution and habitat:** North Queensland, from McIlwraith Range to near Innisfail; in eucalypt woodlands, at 300–700 m altitude. **Map 5.**

**Affinities:** Collections of *P. australiensis* var. *pubigera* are comparable with specimens of two New Guinea species, viz *P. platyclada* Laut. et K. Schum. and *P. vaeletonii* Bremek. They are scarcely separable from some of the specimens of *P. platyclada* Lauterb. et K. Schum. at BRI and NSW, particularly *Brass* 5502 (BRI) collected Sep–Nov 1933, from Auga River, Mafulu, Central Division, and *Brass* 8229 (BRI, L), collected in October 1936, from Lower Fly River, east bank opposite Sturt Island, and they also match quite well with the type of *P. vaeletonii* Bremek. (Dutch New Guinea, N.W. part, *Gjellerup* 168 (holo: L (*n.v.*); iso: K!). These species are no doubt closely related to *P. australiensis* var. *pubigera* but specimens of them so far seen are too few to be sure of their relationship at this time.

*P. platyclada* Lauterb. et K. Schum. and *P. vaeletonii* Bremek. are doubtfully distinct from each other and their relationship needs to be investigated. *P. platyclada* was described by Lauterbach and Schumann (1901) as a glabrous species. Valeton (1911) recognised a hairy variety of this species, viz *P. platyclada* var.



*puberula* Valetton, but Bremekamp (1934) included this variety in his new species *P. valetonii* Bremek. Since the only difference between the above two species appears to be the presence or absence of hairs, and since hairy and glabrous forms are present within many species of *Pavetta*, including *P. brownii* and *P. australiensis*, these species should possibly be recombined. However, specimens of *P. platyclada* and *P. valetonii* available for this study are too few for a comparative study to be undertaken at this time.

Specimens of *P. platyclada* available for study (including Brass 5502 determined by Bremekamp as *P. platyclada*) have sparsely hairy or nearly glabrous leaves and finely hairy inflorescences. Some of them are not unlike some of the collections under *P. australiensis* var. *pubigera*, the latter is therefore probably referable to *P. platyclada* also, but more specimens are needed to be certain.

**Etymology:** The varietal epithet *pubigera*, from Latin *pubi* = softly or weakly hairy, *-ger* = bearing, refers to the finely hairy leaves and inflorescences.

**2. *Pavetta granitica*** Bremek., Feddes Repert. 37: 123 (1934). **Type:** Queensland. NORTH KENNEDY DISTRICT: Burdekin River, November 1856, *F. Mueller* s.n. (holo: K !; iso: MEL (MEL 153307) !).

*P. modesta* Bremek., Feddes Repert. 47: 26 (1939). **Type:** Queensland. COOK DISTRICT: Between Petford and Boonmoo, 24 January 1931, *C.E. Hubbard* & *C.W. Winders* 6864A (holo: n.v.; iso: BRI !).

?*P. indica* var. *stenophylla* Domin, Biblioth. Bot. 89: 623 (1928). **Type:** ad fl. Gilbert River, *Daintree* crescit (n.v.).

[*P. tomentosa* auct. non Roxb. ex Smith: Bailey, Qd Agr. J. 22: 28 (1909). Specimens from Stannary Hills, leg. *Bancroft*].

[*P. indica* var. *tomentosa* auct. non (Roxb.) Hook. f.: Domin, Biblioth. Bot. 89: 624 (1928). Specimens from Stannary Hills, l.c.].

Shrubs or small trees 1–5 m high, bark light grey, very flaky; branchlets, young parts, inflorescence axes and calyces ± hoary with dense, ± appressed or antrorsely curved short hairs; branchlets very pale grey or whitish, often gnarled and with short internodes. Leaves crowded at tips of branchlets, narrowly elliptic, acute or attenuate at both ends, or lanceolate or oblanceolate, (3.8–)9.5–13.0(–16.5) × 0.8–2.5 (–3.2) cm, apex obtuse or subacute, rarely abruptly shortly acuminate and apiculate, margins slightly recurved, base cuneate or acute, decurrent into the usually short petiole; ± coriaceous (thick when dry); both surfaces hairy, very rarely subglabrous to glabrous, the hairs sparse short and slightly curved on upper surfaces, but usually denser, longer, curved or slightly crispate and ± appressed on lower surfaces; upper surfaces sometimes gland-dotted, dark or yellow green, dries greyish brown; midrib very conspicuous, raised on lower surfaces, often pale yellow when dry; lateral nerves very fine, 6–10 pairs, ± arcuate; petioles 2–10(–16) mm long, subterete, hairy; stipules united to below the middle and forming a short sheath, lobes broadly ovate, cuspidate, prominently keeled, densely hairy on the outside with short, antrorsely curved, white hairs, and with dense long fine colleters inside (at base). Inflorescence bearing flowering branchlets 3.5–7.0(–14.5) cm long, covered with light grey or brownish, thin, flaky bark, inflorescences usually much shorter than leaves, usually contracted with short branches, 2.5–5.0 × 3.5–7.5 cm; central branch with 1 or 2 internodes, these (2–)4–10 mm long; reduced leaves usually persistent at upper nodes; lateral branches with a usually flattened 5–15(–20) mm long internode, and 7–27-flowered corymbs; peduncles densely appressed hairy; connate bracts broadly ovate, membranous or with ± scarious margins, appressed hairy on the outside, and with dense long colleters inside (at base). Pedicels usually unequal in length in a cymule, 1–4 mm long (in fruit 5–8 mm long), densely appressed hairy; calyx about 2 mm long, calyx tube densely tomentose, with slightly curved appressed hairs, calyx limb wider than tube, very thin, sparsely hairy, distinctly toothed; calyx lobes broadly ovate, 0.5–0.7 × 0.5 mm, not keeled; corolla tube slender, slightly dilated at throat, (8–)12–14 mm long, about 1.5 mm wide at base and to

2 mm wide at top, glabrous outside; corolla lobes 5.0–6.0 × 1.5–2.0 mm, oblong-elliptic, obtuse; anthers 5–6 mm long; styles 2.5–3.0 cm long, glabrous. Fruits 7–9 × 8–10 mm; seeds depressed globose or ovoid, 4–6 × 4–6 mm. **Fig. 2A.**

**Representative specimens:** Queensland. COOK DISTRICT. Stannary Hills, date unknown, *Bancroft* 294 (BRI (AQ 125110)). Gilbert River, in 1894, \* *Johnson* s.n. (MEL 150220); ditto, date unknown, *Daintree* s.n. (MEL 1537278); Etheridge River, date unknown, *Armit* 93 (MEL);\*\* Quinkin Creek area – Laura River (15°3'S, 144°3'E), May 1975, *Byrnes* 3398 (BRI); Caterpillar Mountains, 31 km along Einasleigh road, off Mt Surprise-Georgetown road, Jan 1992, *Forster* 9655 (BRI); Near Six Mile Waterhole on Gibb's Creek, about 15.5 km W of Irvinebank, Jan 1979, *Lockyer* 172 (BRI); Pannekin Springs area, 29 km W of Mungana (17°07'S, 144°07'E), Jan 1993, *Forster* PIF 12980 (BRI); Between Pefferd and Boonmoo, Jan 1931, *Hubbard & Winders* 6864 (BRI). NORTH KENNEDY DISTRICT: Charters Towers, Apr 1943, *Blake* 14900 (BRI, CANB); Near junction of Broughton and Burdekin Rivers, near Charters Towers, Jun 1931, *Hubbard & Winders* 6972 (BRI);\*\* Mount Bohle, 37 km SW of Charters Towers (20°16' S, 146°01'E), Sep 1991, *Thompson* 266 & *Dillewaard* (BRI). SOUTH KENNEDY DISTRICT: 21.6 km N of Mirtna homestead (20°07' S, 146°11' E), May 1991, *Neldner* 3113 & *Thompson* (BRI). LEICHHARDT DISTRICT: Cheswall Creek area, 3 km of Peak Downs up Wathing Road (22°15' S, 148°58' E), Aug 1990, *Forster* 7256 (BRI);\*\* Coxen Peak (22°12' S, 148°27' E), Aug 1990, *Forster* 7313 (BRI).

**Distribution and habitat:** North and central Queensland, from Stannary Hills to near Peak Downs; on granite, rocky outcrops and hillsides, sandstone escarpments, also on riverbanks; on stony soil or among granite boulders; in open forests; altitudes 300–700 m. **Map 4.**

**Diagnostic features:** *P. granitica* is easily distinguishable from all other Australian species by its narrow, usually hairy, mostly shortly petioled leaves with very conspicuous whitish midrib; by its short, compacted, hairy inflorescences with short branches; by its shortly pedicelled flowers, distinctly toothed calyx, dense appressed hairs on calyx tube, and by its long corolla tubes.

**Affinities:** This species is related to *P. muelleri* of which it has the hairy leaves, short unequal pedicels (in a cymule), distinctly toothed calyx, and densely appressed hairy calyx tube, but

differs from the latter species by its narrow leaves and long corolla tubes. Some forms of *P. rupicola* with narrow leaves, short petioles, and short inflorescences have been confused with *P. granitica* in the past, but *P. rupicola* may easily be distinguished by the hairs on the calyx tube, i.e. the hairs are straight and patent in the latter species, and not appressed as in *P. granitica*, and also in *P. rupicola* the leaves are generally wider and dry a pale brown or yellowish brown.

Although most specimens of *P. granitica* seen in this study are typically hairy, a form with glabrous or subglabrous leaves and inflorescences, from sandstone areas, viz \*\**Byrnes* 3398; \*\**Thompson* 266 & *Dillewaard*; \*\**Forster* 7313, is tentatively included under this species, because, although the specimens available for study are either sterile or incomplete, the leaves resemble those of this species. However, more collections (especially flowering specimens) of this form are necessary to be certain that these specimens are correctly placed.

The glabrous form can be confused with the narrow-leaved form of *P. australiensis*, but the latter species may be distinguished by its much thinner leaves which dries blackish or brownish, by its larger, open inflorescences, longer pedicels, and by its indistinctly toothed calyx.

**Note:** *P. modesta* Bremek. is synonymised under this species because its type is of the same taxon as that of *P. granitica* Bremek. which also occurs in the type locality.

*P. indica* var. *stenophylla* Domin, is also probably referable to *P. granitica* and tentatively synonymised under this name. The type (only specimen cited in the protolog) of *P. indica* var. *stenophylla* Domin is missing. The only specimen from Gilbert River, collected by Daintree (MEL 1537278) available for study, agrees with Domin's original description in its narrow lanceolate leaves, but the specimen is hairy, not glabrous as recorded in the protolog. This specimen, however, is a good match for other collections filed under *P. granitica* (including a collection from Gilbert River, viz \**Johnson* s.n.).

**3. *Pavetta muelleri* Bremek., Feddes Repert. 37: 124 (1934).** Type: Northern Territory. Upper Victoria River, in 1856, *F. Mueller* s.n. (holo: K ! (specimen annotated '*P. muelleri*' by Bremek.); iso: K !; MEL (MEL1537164 !).

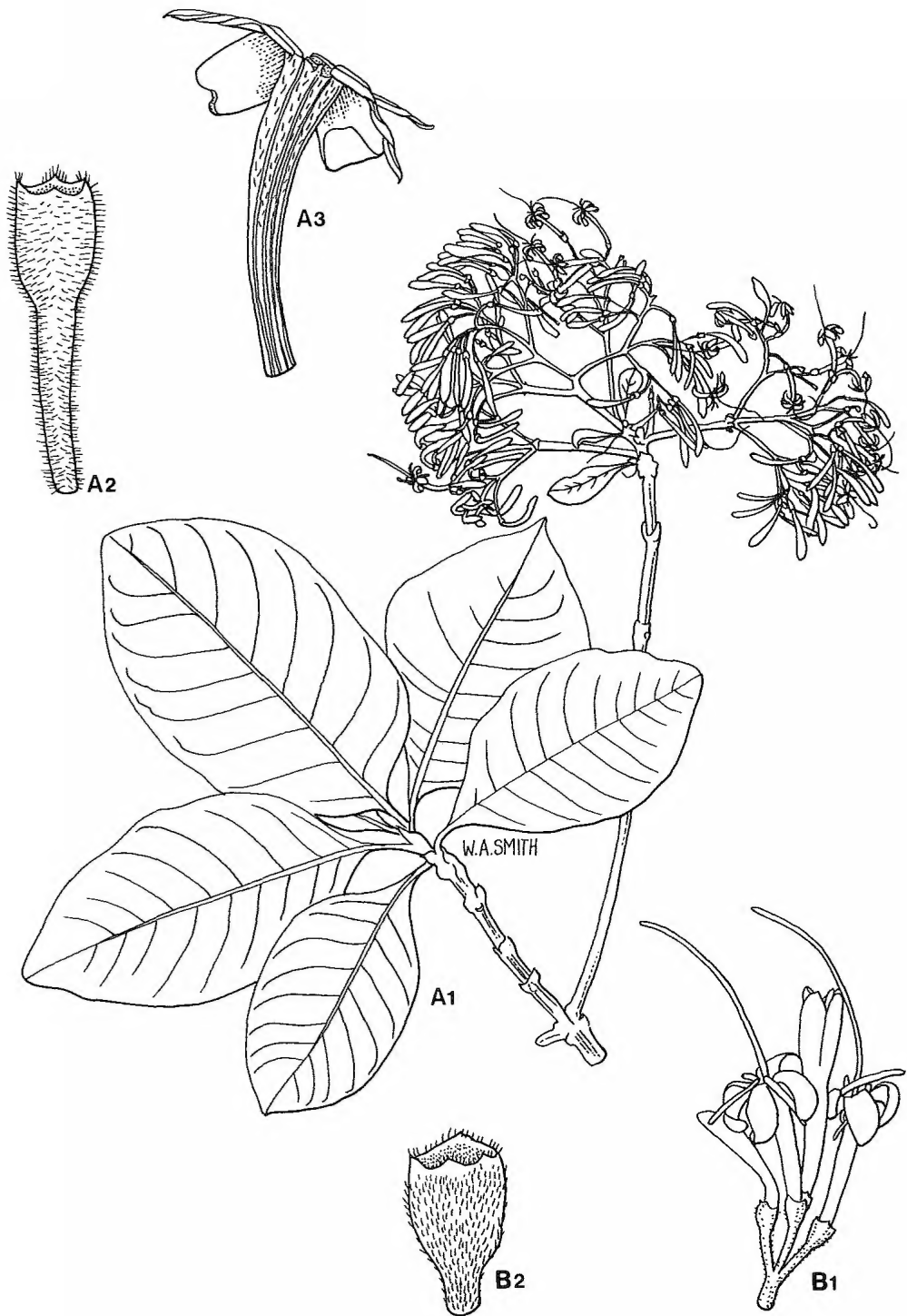
Tall shrubs or small spreading trees 1.5–8.0 m high; bark mid-grey to blackish, stringy or flaky; branchlets with short, spreading, minute,  $\pm$  antrorsely curved or appressed hairs towards their tips. Leaves elliptic or elliptic-oblong, narrowing at both ends, or slightly wider above middle and subobovate, and attenuating into the petiole, (5.2–)10.0–16.5  $\times$  (2.2–)3.5–6.0 (–7.0) cm, apex obtuse,  $\pm$  rounded, rarely emarginate or abruptly shortly acuminate; base acute or subobtuse and abruptly narrowing and attenuate; both surfaces hairy or very rarely subglabrous, upper ones with sparse, short, slightly curved hairs, lower surfaces with dense to sparse long,  $\pm$  curved, fine white hairs (hairs on the midrib longer, shiny and appressed);  $\pm$  coriaceous; upper surfaces usually glossy, slightly resinous and obscurely gland-dotted; usually dries darker above, reddish brown with reddish nerves or occasionally pale brown with whitish nerves; midrib broad, flattened or slightly channelled on upper surface, usually dries reddish-brown; nerves and reticulation very fine, lateral nerves 12–14 pairs, slightly oblique to subpatent, looping at margins; petioles (0.5–)1.0–2.5 cm long, flattened or channelled above. Stipules at apex of branchlets, ovate, long-acuminate, others briefly connate near base and forming a very short, oblique sheath, lobes broadly ovate, cuspidate, prominently keeled, densely white hairy on outside with long and short appressed hairs, and with fine long colleters on the inside (at base). Inflorescence bearing flowering branchlets (1.2–)5.0–10.5 cm long, covered with pale or greyish flaky bark; inflorescences 4.5–6.0  $\times$  6.5–11.5 cm, open, usually branching from base with laxly corymbose branches, central branch with (1–)2 or 3 thick internodes, these 5–10 mm long; reduced leaves usually persistent at all the nodes; lateral branches usually with a long, (6–)12–20 mm long, flattened internode, and 20–34-flowered corymbs; cymules long-stalked (stalks 8–12 mm long); connate bracts broadly ovate, cuspidate,  $\pm$  membranous, densely hairy on the out-

side with shiny, long, white appressed hairs, and with long fine colleters on the inside (at base); peduncles densely hairy with curved appressed hairs. Pedicels usually unequal in length in a cymule, (0.5–)2.0–3.0(–7.0) mm long (in fruit 3–8 mm long), slender, densely hairy with  $\pm$  antrorsely curved hairs. Calyx 1.5–2.7 mm long, usually with a long, flared, conspicuously toothed limb, calyx tube densely tomentose with fine, white, slightly curly, usually appressed hairs, the hairs slightly sparser on the limb; limb wider than the tube, and one half to one third the length of the tube; calyx lobes 0.5–0.7  $\times$  0.5–0.7 mm, broadly ovate, hairy or subglabrous on the outside; corolla tube slender, dilated towards mouth, (4–)7–10 mm long, about 1.5 mm wide at base, 2–3 mm wide at top, glabrous or rarely pilose outside, corolla lobes sometimes nearly as long as the tube, 5.0–6.5  $\times$  2.0–3.0 mm, oblong-elliptic, obtuse; anthers 4.0–5.5 mm long, styles 2.5–3.7 mm long, glabrous. Fruits 6–7  $\times$  6–8 mm; seeds depressed globose, 3.0–4.0  $\times$  5.0–6.5 mm. **Fig. 1B.**

**Representative specimens:** Western Australia. Vicinity of Kimberley Research Station near Kununurra, 1969, *Mackenzie* 710209 (CANB). Northern Territory. Keep River National Park (15°40'S, 129°08'E), Feb 1988, *Dunlop* 5720 (DNA); 2 km E of Victoria River, Dec 1988, *Russell-Smith* 6522 & *Lucas* (DNA); Gregory National Park, 4 km W of Victoria River bridge, Mar 1986, *Thomson* 1412 (DNA); Sea Range, Dec 1855, *Mueller* s.n. (MEL); Vicinity of El Sharana Mining Camp, Jan 1973, *Martensz & Schodde* AE 386 (BRI, DNA); N side of Mt Brockman, Feb 1973, *Craven* 2341 (BRI, CANB, DNA); \*Oenpelli, Sep 1948, *Specht* 1045 (BRI).

**Distribution and habitat:** East Kimberley, Western Australia to Arnhem Land, Northern Territory; usually on sandstone plateau, outcrops, escarpments, hillsides and ridges. **Map 3.**

**Diagnostic features:** *P. muelleri* is distinguishable by its mostly shortly petioled, usually hairy, elliptic or subobovate, obtuse, glossy leaves which dry brown or reddish brown with reddish brown or whitish, usually oblique lateral nerves; by its widely branched inflorescences with cymules on long stalks, usually short pedicels (which are mostly unequal in a cymule), and by its dense,  $\pm$  curly, usually appressed white hairs on the calyx, and also by its distinct calyx lobes.



**Fig. 1.** A. *Pavetta brownii* var. *brownii*: A<sub>1</sub>, branchlet with flowers  $\times 0.6$ . A<sub>2</sub>, calyx with pedicel  $\times 4$ . A<sub>3</sub>, longitudinal section of corolla  $\times 4$ . B. *P. muelleri*: B<sub>1</sub>, cymule  $\times 2$ . B<sub>2</sub>, calyx  $\times 4$ . A. Jessup 821. B. Russell-Smith 6522.

**Notes:** *P. muelleri* is quite variable, especially in the colour of dried leaves, and length of pedicels and corolla tubes. Specimens from around Victoria River and Kununurra in Western Australia have elliptic-oblong or subobovate, mostly glossy leaves which dry brown with whitish nerves, or reddish brown with reddish nerves, and have a large amount of lateral nerves, long pedicels and corolla tubes. Specimens from Arnhem Land, Northern Territory, viz El Sharana and Mt Brockman, have usually wider, shiny, elliptic leaves with fewer pairs of lateral nerves, densely white hairy connate bracts, shorter pedicels and usually smaller flowers (especially ones from hillsides and ridges). A collection from Oenpelli, viz Specht 1045, is tentatively included here, although it differs from other specimens in having more or less glabrous leaves, because in other characters they are those of this species.

**Affinities:** *P. muelleri* resembles *P. kimberleyana* of which it has the calyx hairs and general aspect, but the latter species differs by its usually larger, less hairy leaves, longer petioles, pedicels and fruit stalks (see under this species).

*P. muelleri* had been confused with *P. brownii* in herbaria, mainly because specimens belonging to these species are often difficult to identify in the absence of fertile material. However, *P. brownii* differs from this species by its mostly broader ((3.5–)4.5–9.2 cm wide), elliptic or elliptic-oblong leaves which usually dry blackish or infused with black, by its fewer lateral nerves (6–10 pairs), by its longer pedicels ((4.5–)6.0–12.0 mm long (9–14 mm long in fruit)), minute calyx lobes, and straight, usually patent hairs on calyx tube.

**4. *Pavetta kimberleyana* S.T. Reynolds sp. nov.** *P. muelleri* Bremek. persimilis autem differt petiolis et pedicellis fructiferis multo longioribus (2–4-plo longioribus), foliis plerumque sparsim pubescentibus vel subglabris. **Typus:** Western Australia. Mitchell Plateau, unnamed tributary of Mitchell River (14°45'S, 125°38'E), 8 December 1982, K.F. Kenneally 8678 (holo: BRI; iso: PERTH).

[*P. indica* var. *tomentosa* auct. non (Roxb.) J.D. Hooker: Domin, Biblioth. Bot. 89: 623 (1928). Specimens from Roebuck Bay, leg. *Tepper*].

[*P. brownii* auct. non Bremek.: Koeh in Wheeler, Fl. Kimberley Region, 922 (1992)]

Shrubs or small trees 3–8 m high; bark silver grey, yellow-grey or greyish brown, stringy; young parts especially young leaves densely hairy with long white hairs; branchlets sparsely hairy at their tips with very fine short, slightly antrorsely curved or appressed hairs. Leaves broadly lanceolate or elliptic, rarely subobovate, (6.0–)8.5–25.0 × (2.5–)5.5–8.5 cm, apex obtuse or sometimes ± rounded, rarely subacute, apiculate; base subacute or obtuse and abruptly attenuate and decurrent into the long petiole; ± coriaceous; upper surfaces usually with a slight sheen, sparsely hairy with short, slightly curved hairs, soon glabrous, or hairy only on midrib; lower surfaces covered with dense (younger leaves) or sparse, fine, long, soft, curved or ± crispate, usually ± erect, white hairs (hairs longer on the midrib), or hairy only on the midrib and nerves, rarely with very small, hairy tufts in the axil of the main nerves; sometimes obscurely gland-dotted, dries pale brown, yellow-brown or olive-brown with conspicuous whitish or pale yellow midrib and nerves; midrib broadly channelled towards the base on upper surface; lateral nerves very slender, 9–11(–13) pairs, slightly oblique, ascending at their tips, or ± arcuate, sometimes impressed above, reticulate venation as fine as the nerves; petioles (1.2–)2.4–3.5 cm long, flattened or channelled above, finely hairy with short, appressed hairs, or glabrous; stipules at tips of branchlets usually globose-ovoid, with a long curved acumen at apex, others usually squat, united to about middle and forming an oblique sheath, lobes obliquely ovate, long-cuspidate, prominently keeled (the keel usually darker and brownish), densely white hairy on the outside with very short, antrorsely curved or ± appressed hairs, or ± glabrous. Inflorescence bearing flowering branchlets 1–3(–6) cm long, covered with thin pale grey flaky bark; inflorescences 4.5–8.5 × 9.0–14.5 cm, very open and laxly corymbose, usually with long lateral branches; central branch

with (1) 2 or 3 internodes, these (6–)12–17 mm long; reduced leaves usually persistent at nodes; lateral branches with long flattened internodes 10–27 mm long, and 13–24-flowered corymbs; cymules long stalked (stalks about 2.5 cm long); connate bracts broadly ovate, obtuse, usually thin and scarious, with dense white appressed hairs on the outside, and with long fine colleters inside (at base); peduncles appressed hairy with curved hairs. Pedicels (2.5–)3.5–4.5(–10.0) mm long, in fruit (7–)10–20 mm long, finely hairy with short, antrorsely curved or  $\pm$  appressed hairs; calyx 2.0–2.5 mm long, with slightly flared pale thin limb and distinct lobes; calyx tube usually with moderately sparse, short, very slightly curved, white, appressed hairs on outside, the hairs sparser on the limb; calyx lobes  $0.5\text{--}1.25 \times 0.5\text{--}1.25$  mm, broadly ovate, obtuse; corolla tube slender, dilated towards mouth, 9–11(–15) mm long, 1.5–2.5 mm wide at top, glabrous outside, pilose at throat; corolla lobes nearly half as long as the tube,  $5.5\text{--}7.0 \times 2.0\text{--}3.0$  mm, elliptic-oblong, obtuse; anthers 5.5–6.5 mm long; filaments about 1.5 mm long; styles 2.0–3.2 cm long, glabrous. Fruit 6.0–6.5  $\times$  6.0–7.5 mm, puberulous or glabrous; seeds subglobose,  $3.5\text{--}5.0 \times 5.0\text{--}5.5$  mm.

**Representative specimens:** Western Australia. Mitchell Plateau, Camp Creek, approx. 1.5 km S of CRA Mining Camp ( $14^{\circ}49'S$ ,  $125^{\circ}50'E$ ), Jan 1982, *Kenneally* 7945 (PERTH); Mitchell Plateau, Lone Dingo, Feb 1979, *Beard* 8478 (BRI, PERTH); Augustus Island, Bonaparte Archipelago ( $15^{\circ}25'S$ ,  $124^{\circ}35'E$ ), May 1972, *Wilson* s.n. (PERTH); West Kimberley, gorge of unnamed creek running E of Sale River, 30 km ESE of mouth ( $16^{\circ}02'S$ ,  $124^{\circ}46'E$ ), May 1986, *Kenneally* 9634 (BRI, CANB); \* Cygnet Bay, date unknown, *Cunningham* 91 (BM); \*\* Roebuck Bay, in 1889, *Tepper* 61 (MEL 1553916); ditto, in 1890, *Teppers* s.n. (MEL 1553958); Between Wonganut Springs and Beagle Bay Rd, N of Broome ( $17^{\circ}25'S$ ,  $122^{\circ}20'E$ ), Jan 1984, *Willing* 112 (PERTH).

**Distribution and habitat:** Kimberley region, Western Australia, chiefly coastal from Mitchell Plateau to near Broome, also on offshore islands; usually in vine thickets, behind coastal dunes, along creeks, rivers, and near sandstone outcrops and sandstone scarps. **Map 5.**

**Diagnostic features:** *P. kimberleyana* is distinguished by its long petioles, long pedicels especially those of fruits, appressed hairy calyx tube, and its sparsely hairy to subglabrous leaves which usually dry pale brown, yellowish brown to olive-brown with usually whitish nerves.

**Notes:** This species varies in its leaves, hairiness and in the size of calyx and corolla lobes. Two or three rather distinct forms are recognizable as indicated below, but the forms are not formally named here, because, with the exception of the typical form, the other forms are poorly represented (by two or three collections), or represented by incomplete material to be certain that their differences are consistent. The typical form occurs at Mitchell Plateau, it has usually large, sparsely hairy to  $\pm$  glabrous leaves which are hairy (sparsely hairy) only on midribs, laxly corymbose inflorescences, and moderately long corolla tubes (9–11 mm long). Whereas the form from around Broome, has larger, many-flowered inflorescences, very thin,  $\pm$  glabrous calyx, and longer corolla tubes ((10–)12–15 mm) long. Specimens from around Cygnet Bay differ from the above forms in their rather distinctive long calyx lobes (about 1.25 mm long) but specimens seen of this taxon are too poor (old specimens) to judge if this character is consistent. Specimens from offshore islands (only fruiting specimens seen) usually have hairier leaves and short compact inflorescences.

**Affinities:** *P. kimberleyana* is comparable to *P. muelleri* Bremek. of which it has the general aspect, rather similar leaves and calyx hairs, but the latter species differs by its shorter petioles (0.5–2.5 cm long), shorter pedicels especially those of fruits (3–8 mm long), by its usually hairier, elliptic-oblong or subobovate leaves with glossy usually resinous upper surfaces, by its greater number of lateral nerves (12–14 pairs), and by its denser, longer,  $\pm$  curly, white appressed hairs on the calyx tube (and usually calyx limb as well).

**Note:** \* Cunningham's collection from Cygnet Bay, Western Australia, was cited under *P. brownii* Bremek. by Bremekamp (1934), and \*\* Tepper's collections from Roebuck Bay, was cited under *P. indica* var. *tomentosa* by Domin. The former species as circumscribed here, does not occur in Western Australia, while the latter name is misapplied (as indicated above).

**Etymology:** The specific epithet refers to the region where this species occurs, i.e. the Kimberley Region of Western Australia.

5. *Pavetta brownii* Bremek., Feddes Repert. 37: 125 (1934). **Type:** Queensland. COOK DISTRICT: Carpentaria, Coen River, 6 November 1802, R. Brown 3449 p.p. (lecto (here designated): BM).

[*Ixora tomentosa* auct. non Roxb.: Benth., Fl. austral. 3: 414 (1867); Ewart & Davies, Fl Northern Territory, 258 (1917) ].

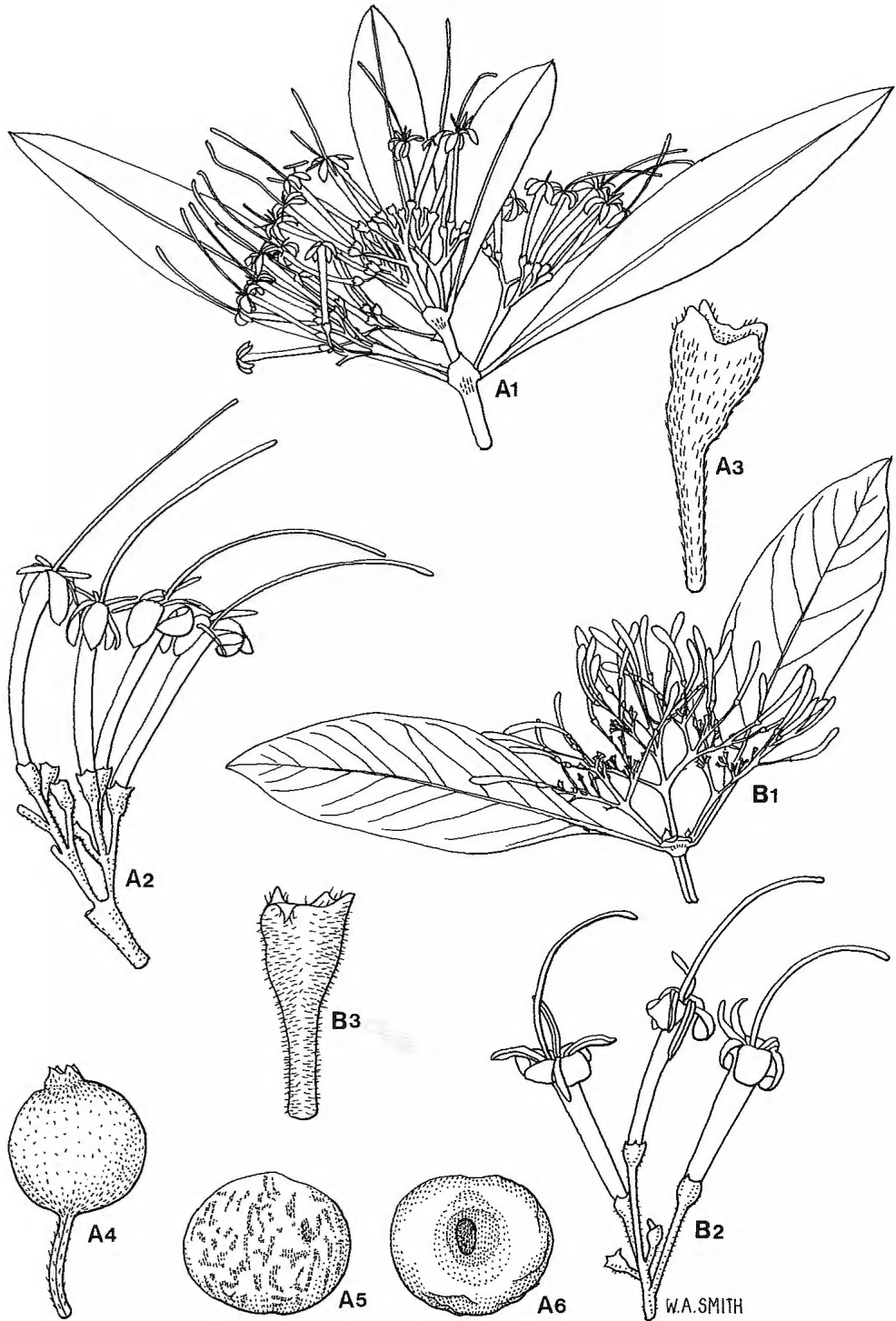
[*Pavetta tomentosa* auct. non Roxb. ex Smith: F. Muell., Fragm. 9: 182 (1875); Bailey, Comprehensive Cat. Qd Pl. 245 (1909) ].

Shrubs or small trees 1–5 m high; bark usually grey and stringy; branchlets with fine, short, slightly antrorsely curved or spreading hairs, rarely glabrous. Leaves elliptic or oblong-elliptic, rarely  $\pm$  obovate, (7.5–)9.0–15.5(–21.0)  $\times$  (3.5–)4.5–8.0(–9.2) cm, apex obtuse or subacute, rarely  $\pm$  rounded or abruptly shortly acuminate, base obtuse and abruptly attenuate into the petiole, or subacute, occasionally  $\pm$  truncate and abruptly attenuate; usually slightly coriaceous; both surfaces hairy or glabrous, the hairs on upper surfaces sparse, short,  $\pm$  rigid, curved, those on lower ones dense or sparse, fine, mostly erect (appressed on the midrib), occasionally the upper surface glabrous and only the midrib of the lower surface hairy; usually obscurely gland-dotted; dries brown or blackish (usually younger leaves) or infused with black (especially midrib and nerves); midrib broad, flattened, channelled towards base on upper surfaces, raised below; lateral nerves 8–10 pairs, patent or sometimes  $\pm$  oblique; finely reticulate-veined; petioles 0.8–1.7(–2.2) cm long (to 3 cm long in one collection), hairy or glabrous. Stipules 5–7 mm long, united to about middle and forming a short sheath, slightly truncate, or with ovate, cuspidate, prominently keeled lobes, dries pale brown with thin pale margins, glabrous, or hairy outside with fine long appressed hairs, and with dense long colleters on the inside (at base). Inflorescence bearing branchlets 4.0–14.5 cm long, covered with pale grey or brown flaky bark; inflorescences 5.0–7.5  $\times$  7.5–10.0 cm, laxly corymbose, usually dries infused with black or blackish, central branch with 1 or 2(3) internodes, these

5–15(–30) mm long, with or without reduced leaves at nodes; lateral branches with (6–)11–20 mm long internode, and (7–)12–24-flowered corymbs; peduncles glabrous or sparsely hairy with straight, spreading, or slightly antrorsely curved or  $\pm$  appressed hairs; connate bracts broadly ovate, squat,  $\pm$  very thin, glabrous, or hairy with fine, shiny, white, dense appressed hairs on outside, and with dense long colleters on the inside (at base). Pedicels (4.5–)6.0–12.0 mm long (in fruit (9–)12–14 mm long), spreading to  $\pm$  appressed hairy or glabrous; calyx with slightly flared, indistinctly toothed, paler,  $\pm$  membranous limb, 1.5–2.5  $\times$  1.5–2.0 mm, glabrous or with dense, very fine, white, shiny, straight or slightly curved, spreading sometimes reflexed, or  $\pm$  appressed hairs on the calyx tube and sparser hairs on the calyx limb; calyx lobes minute, 0.3–0.5 mm long,  $\pm$  triangular or narrowly ovate to subulate, apiculate, keeled; corolla (obtuse in bud) mostly dries blackish or infused with black or pale, tube slightly dilated towards the mouth, 6–9(–11) mm long, about 1 mm wide at base and to 2.5 mm wide at top, glabrous outside, pilose at throat; corolla lobes one third to half the length of the tube, 4.5–6.0  $\times$  1.5–2.0(–3.0) mm, oblong-elliptic, obtuse, usually infused with black; anthers 4–6 mm long; filaments 0.5–2.0 mm long; styles 2–3 cm long, puberulous or glabrous, stigma glabrous or pilose. Fruits 6.0–8.0  $\times$  6.0–7.5 mm, glabrous; seeds subglobose, 4.0–7.0  $\times$  5.0–7.5 mm.

**Diagnostic features:** *P. brownii* may be distinguished from related species by its broadly elliptic, elliptic-oblong or subobovate, usually obtuse or subacute, hairy or glabrous leaves, few pairs of usually patent lateral nerves, by its many-flowered corymbs, and by its dense straight, patent or  $\pm$  appressed hairs on the calyx tube, and also by its minute keeled calyx lobes. The leaves and inflorescence of this species tend to dry blackish in the herbarium.

This species is extremely variable, especially in leaf and inflorescence size, degree of hairiness, nature of hairs on the calyx tube and in the colour of dried leaves and inflorescences. Two varieties are distinguished as follows.



**Fig. 2.** A. *Pavetta granitica*: A<sub>1</sub>, branchlet with flowers × 1. A<sub>2</sub>, part of inflorescence × 1. A<sub>3</sub>, calyx with pedicel × 4. A<sub>4</sub>, fruit × 4. A<sub>5</sub>, dorsal view of seed × 4. A<sub>6</sub>, ventral view of seed × 4. B. *P. tenella*: B<sub>1</sub>, branchlet with flowers × 0.6. B<sub>2</sub>, part of inflorescence × 2. B<sub>3</sub>, calyx with pedicel × 4. A<sub>1,3</sub>, unknown collector (MEL 1553966). A<sub>4,6</sub>, Cumming 9603. B<sub>1,3</sub>, Forster 6082.



1. Leaves, branchlets and inflorescence hairy, the hairs on the leaves covering both surfaces or restricted to the midrib. . . . . var. **brownii**  
 Leaves, branchlets and inflorescence glabrous, rarely with a few scattered hairs on inflorescence axes and calyx. . . . . var. **glabrata**

**P. brownii** Bremek. var. **brownii**

*P. brownii* var. *pubescens* Bremek. l.c. 125.  
**Type:** Carpentaria, December 1802, *R. Brown* 3449 p.p. (holo: K !; iso: BM !). (annotated by Bremekamp as type *P. brownii* var. *pubescens*, and by Brown as '*Pavetta mollis*')

*P. brownii* var. *glabra* Bremek. l.c. 125.  
**Type:** Carpentaria, Dec 1802, *R. Brown* 3451 p.p. (holo: K !).

*P. insulana* Bremek., Feddes Repert. 37: 124 (1934). **Type:** Queensland. COOK DISTRICT: Thursday Island, Torres Strait, *Jaheri* 250b (holo: L!).

*P. indica* var. *obovata* Domin, Biblioth. Bot. 623 (1929). **Type:** North Australia: Carpentaria, *R. Brown* Iter Australiense, 1802–1805, *Brown* [3451, p.p.] als *Ixora obovata* *Brown* ms. (holo:K!; iso:BM!, CANB!).

[*P. tomentosa* auct. non Roxb. ex Smith: F. Muell., l. c. 182; Bailey, l. c. 245].

[*Ixora tomentosa* auct. non Roxb.: Benth., l.c. 414].

Distinguishing characters are as indicated in the key above. The leaves are hairy on both surfaces, occasionally ± glabrous with only the nerves and midrib hairy, but the inflorescence is mostly densely hairy. **Fig. 1A.**

**Representative specimens:** Queensland and Northern Territory. Islands of the Gulf of Carpentaria, Dec 1802, *Brown* 3449 p.p. (BM, K, CANB) (specimens labelled Carpentaria, and annotated '*Pavetta mollis*' or '*Ixora obovata*' by Brown at K and BM, and labelled North Coast at CANB). Northern Territory. Bremer Island, NE Arnhem Land, Nov 1986, *Wightman* 4827 & *Jackson* (DNA); Gove Peninsula, Port Bradshaw, Oct 1983, *Wightman* 750 (CANB, DNA); ditto, 3 km NE of Port Bradshaw, Feb 1988, *Russell-Smith* 4680 & *Lucas* (BRI); Groote Eylandt, Mamalimandja Point, Jul 1987, *Russell-Smith* 2803 & *Lucas* (DNA); E side of South East Island, Sir Edward Pellew Group, Feb 1976, *Craven* 3808 (CANB); SE of Calvert River mouth (16°26'S, 137°52'E), Jan 1989, *Brock*

432 (DNA); Donydji, Arnhem Land, Jun 1990, *Dunlop* 8666 & *White* (BRI); NE Arnhem Land, Garadandabol Bay (12°26'S, 136°18'E), Feb 1988, *Russell-Smith* 4760 & *Lucas* (BRI). Queensland. COOK DISTRICT: Thursday Island, Jul 1974, *Heatwole* & *Cameron* 59 (QRS); ditto, May 1906, *Tate* s.n. (BRI); Badu Island, Jun 1979, *Garnett* 98 (BRI); Coen River, Nov 1802, *Brown* 3449 p.p. (BM); Pine River basin, southern end near mouth, Feb 1981, *Morton* 1112 (BRI, QRS); Weipa, Evan's Landing road to Lake Patricia, Nov 1986, *Jessup* 821 (BRI); ditto, Lake McLeod (12°19'S, 141°51'E), Mar 1990, *Forster* PIF 6467 & *O'Reilly* (BRI); Silver Plains - Goanna Creek road, Nov 1956, *Webb* 3192 (BRI); Mapoon, May 1911, *Bick* 119 (BRI).

**Distribution and habitat:** Northern Australia, from eastern Arnhem Land, Northern Territory, along the Gulf of Carpentaria especially on offshore islands to Cape York Peninsula, Queensland; usually in coastal scrubs, on sand dunes. **Map 2.**

**Notes:** *P. brownii* var. *brownii* consists of two or three rather distinct forms which differ especially in the nature of hairs on the calyx, in the leaves and in the colour of dried leaves and inflorescences in the herbarium. However, these forms are not formally named here, because they are poorly known, poorly represented, or represented by inadequate material, and therefore difficult to ascertain if their distinguishing features are consistent.

The majority of specimens from Queensland, viz Weipa, Mapoon, Silver Plains, and collections from eastern Arnhem Land, Northern Territory, viz Gove Peninsula and Groote Eylandt, and also collections from along the Gulf of Carpentaria, are typical. They resemble *Brown* 3449 p.p. from Coen River, and some of the specimens of *Brown* 3449 p.p. from the islands of the Gulf of Carpentaria, in their hairy leaves which dry brown or blackish or with blackish nerves, and patent straight hairs on the calyx tube. However, the majority of specimens from Northern Territory, especially those from offshore islands of the Gulf of Carpentaria, differ in having slightly antorsely curved to ±

appressed hairs on the calyx tube, and are not unlike the remainder of specimens of *Brown* 3449 p.p. from the Gulf of Carpentaria. Specimens from Torres Strait islands previously known as *P. insulana*, though, have sparsely hairy leaves (usually with hairs only on the midrib of lower surfaces) which dry brownish with usually whitish nerves, have very fine, short, usually  $\pm$  appressed hairs on the calyx tube, and mostly shorter corolla tubes.

**Note:** The two varieties recognised by Bremekamp (1934), viz *P. brownii* var. *pubescens* Bremek., and *P. brownii* var. *glabra* Bremek. are reduced under *P. brownii* var. *brownii*, because the types of these varietal combinations are of the same taxon as that of the typical variety (see typification). Specimens previously identified as *P. brownii* var. *glabra* are now included under *P. brownii* var. *glabrata*.

***P. brownii* var. *glabrata*** S.T. Reynolds var. nov. a *P. brownii* Bremek. var. *brownii* ramulis foliis pedunculis pedicellis calycibusque glabris vel glabratiss differt. **Typus:** Queensland. COOK DISTRICT: Dauan Island, Torres Strait, 10 September 1971, *M. Lawrie* s.n. (holo : BRI (AQ3897)).

Distinguishing characters are as indicated in the key above. This variety is poorly represented, it has elliptic or  $\pm$  obovate leaves which are broad, obtuse or  $\pm$  rounded at apex, and are usually shorter than in the typical variety.

**Specimens examined:** Northern Territory. Gove Peninsula, Jul 1987, *Russell-Smith* 2948, and *Lucas* (BRI). Queensland. COOK DISTRICT: Dauan Island, Torres Strait, Sep 1971, *Lawrie* s.n. (BRI); Cape York, date unknown, *Daemel* s.n. (BM); Rex Lookout, Cook Highway (16°–'S, 145°–'E), Jan 1978, *Winkel* s.n. (BRI). BURKE DISTRICT: \* Pisonia Island (island 'e'), Dec 1802, *Brown* 3451 p.p. (BM); \* Islands of the Gulf of Carpentaria, Dec. 1802, *Brown* 3451 p.p. (BM, NSW (NSW 193879)).

\* These specimens appear to be from the same collection. The specimens at BM are determined *P. brownii* var. *glabra* by Bremekamp in 1932 (the latter collection was annotated by him as type of this varietal name), and annotated by Brown as '*P. glabrata*' ms. The specimen at NSW (ex Herb. BM) is labelled '*Ixora obovata*' ms, North Coast (not

Brown's handwriting), in addition to the BM label.

**Distribution and habitat:** As in the typical variety. **Map 3.**

**Diagnostic features:** *P. brownii* var. *glabrata* can be confused with some of the forms of *P. australiensis* var. *australiensis*, but the latter may be distinguished by its generally thinner (usually very thin when dry), elliptic, lanceolate or oblanceolate leaves with acuminate, acute or subobtuse apex, by its fewer lateral nerves (6–9(–12) pairs), and by its longer corolla tube ((7–)12–17 mm long).

**Etymology:** The varietal epithet *glabrata*, from Latin *glabratus* = nearly glabrous, refers to the glabrous or nearly glabrous leaves and inflorescences of this variety.

**Typification of *P. brownii*:** There has been much confusion regarding specimens numbered *Brown* 3449 and 3451 which Bremekamp (1934) had nominated as types of the two varietal combinations under *P. brownii* Bremek. This is because similar looking specimens had been given different numbers, viz *Brown* 3449 or 3451, and also because the nominated type of *P. brownii* var. *glabra* Bremek. was found to be of the typical variety.

The nominated type of *P. brownii* var. *pubescens* Bremek., viz *Brown* 3449 (K) from the Gulf of Carpentaria, is hairy and agrees with Bremekamp's original description attached to the varietal name. It also matches specimens with the same number at BM. However, the nominated type of *P. brownii* var. *glabra* Bremek., viz *Brown* 3451 p.p. (K), also from the Gulf of Carpentaria, is hairy as well and does not agree with his protolog to the varietal name, nor does it match specimens of *Brown* 3451 at BM, which are glabrous or nearly so (i.e. glabrous or subglabrous leaves, and glabrous or hairy inflorescences).

The nominated type of *P. brownii* var. *glabra* at K, however, matches the other duplicate of *Brown* 3451 at K which was cited by Bremekamp under *P. brownii* var. *pubescens*. It also matches *Brown* 3449 (K), the nominated type of *P. brownii* var. *pubescens*, and other

specimens of *Brown* 3449 at BM including the collection from Coen River.

Although in 1932 Bremekamp selected and annotated the BM sheets of *Brown* 3449 and 3451 as types of *P. brownii* and its varieties, in 1934 when he wrote up his revision, he nominated only the K sheets as types and did not cite any BM specimens. He did not formally cite a type for the name *P. brownii* although in 1932 he annotated the specimen from Coen River, *Brown* 3449 at BM, as 'type *P. brownii*'. This specimen is now selected as lectotype of this name.

*P. brownii* var. *pubescens* Bremek. is here synonymised under *P. brownii* var. *brownii*, because the nominated type of *P. brownii* var. *pubescens* Bremek. *Brown* 3449 p.p. (K, BM) from Gulf of Carpentaria, is the same taxon as *Brown* 3449 (BM) from Coen River, which Bremekamp had in 1932 annotated as 'type *P. brownii*'. Bremekamp (1934) also cited hairy taxa under the name *P. brownii*, and his intentions with regards to the typical variety are quite apparent.

Because the nominated type of *P. brownii* var. *glabra* Bremek. is a hairy specimen which does not agree with Bremekamp's protolog of *P. brownii* var. *glabra*, but agrees with the type of *P. brownii* var. *brownii*, the former name is here reduced to synonymy under the typical variety. Bremekamp did not cite any other specimen under *P. brownii* var. *glabra*. Specimens previously under that varietal name are now placed under *P. brownii* var. *glabrata*.

The sheets at K and BM are not numbered, and in most cases several specimens, sometimes of different taxa, or from mixed gatherings, are mounted together on the same sheet. Therefore, detailed information on the labels attached to the specimens, including annotations made by Brown and Bremekamp, is reproduced here to identify the types. The exact collecting localities of most of the specimens of *Brown* 3449 and 3451 are not known. Whether or not similar looking specimens mounted on the same sheet or on different sheets, came from the same collection is also not known. Most specimens or sheets of *Brown* 3449 and 3451 are labelled 'Carpentaria' or 'islands of the Gulf of

Carpentaria'. A few specimens at BM have exact collecting locality details associated with them. *Brown* 3449 p.p. at BM is labelled 'Coen River', while others with the same number at BM and K are labelled 'Carpentaria' or 'Islands of the Gulf of Carpentaria'. Sheets or specimens of *Brown* 3451 at K (hairy specimens) are labelled 'Carpentaria', while others of *Brown* 3451 at BM (specimens with glabrous leaves with glabrous or hairy inflorescences) are labelled 'island e' (Pisonia Island), or 'insula varia (islands of the Gulf of Carpentaria), viz islands 'f' (one of the Bountiful Islands.), 'o' (North East Island), 'g' (Vanderlin Island), 'h' (North Island, Sir Edward Pellew Group). Whether the specimens mounted on the one sheet, or on different sheets came from the one island or from different islands, or whether they came from a single or several collections, cannot be determined from the labels attached to these sheets.

***P. brownii* and *P. insulana* complex:** *P. brownii* Bremek. and *P. insulana* Bremek. are treated here as being conspecific because specimens which have been referred to either species resemble each other especially in their general aspect, leaves, inflorescences, calyx lobes and length of corolla tubes. Consequently, difficulties were experienced in trying to delimit these species.

Bremekamp, who described both species (1934), used the number of internodes of the central branch of the inflorescence to distinguish the species, but he saw only the type of *P. insulana*, and a few specimens of *P. brownii*. As more specimens became available, this distinguishing character was found to be very variable and therefore unreliable to separate the two species.

The types of both species names at first sight appear to be quite different. For example, type material of *P. brownii* Bremek. (flowering and fruiting specimens) have straight spreading or slightly antrorsely curved to  $\pm$  appressed hairs on the calyx tube, and leaves and inflorescences usually dry blackish, whereas the type of *P. insulana* Bremek. (fruiting specimen) has very short  $\pm$  appressed hairs on the persistent calyx tube, and leaves which dry brownish.

However, intermediate forms of both these taxa are now known, and specimens from the type localities (Gulf of Carpentaria and Torres Strait) were found to vary in the calyx hairs and in the colour of dried leaves, even in specimens collected from the same locality. The species are therefore treated here as being conspecific. Though the names are of equal date, *P. insulana* Bremek. is here synonymised under the more widely known *P. brownii* Bremek., which is treated here as a name applicable to a very variable species.

**6. *Pavetta rupicola* S.T. Reynolds sp. nov.** primo aspectu *P. brownii* Bremek. et *P. graniticae* Bremek. persimilis; a *P. brownii* foliis plerumque angustioribus, nunquam siccitate nigrescentibus, petiolis pedicellisque brevioribus, et corollo tubo longiore (8–16 mm longo) differt; a *P. graniticae* propter pilos strictos patulos in foliis calycibusque et foliis plerumque latoribus ((1.5–)2.7–5.5 cm latis) haud aegre distinguitur. **Typus:** Queensland. BURKE DISTRICT: Adel's Grove via Camooweal, 17 February 1947, A. de Lestang 309 (holo: BRI).

Shrubs to 2.5 m high; bark grey, flaky; young parts especially young leaves densely hairy; branchlets, leaves and inflorescence axes usually densely hairy with slightly patent hairs. Leaves elliptic, ± oblanceolate or subobovate, (5.5–)10.0–13.5 × (1.5–)2.7–5.5 cm, apex subacute or obtuse, base obtuse or subacute; ± coriaceous; both surfaces finely hairy, upper ones with sparse fine hairs, lower ones usually densely hairy with fine, ± erect white hairs; dries yellow-brown or pale brown with pale or dark nerves; lateral nerves 6–10 pairs, slightly oblique or arcuate; petioles 5–10 mm long, densely hairy. Stipules at tips of branchlets ovate or triangular with a long acumen, others connate to above middle, forming a short sheath and with small subulate aristate lobes, or lobes ovate, cuspidate or long aristate, prominently keeled, densely hairy on the outside with shiny, white, ± appressed hairs. Inflorescence bearing branchlets (1.5–)4.0–10.5 cm long, covered with very pale greyish white, thin, very flaky or stringy bark, inflorescences usually with contracted branches, laxly corymbose, 2.5–4.0 × 4.0–6.0 cm; central branch with one internode,

(3–)5–7 mm long, reduced leaves usually persistent at nodes; lateral branches with 5–11 mm long internode, and 9–14-flowered corymbs; peduncles densely patent hairy; connate bracts broadly ovate, velvety outside. Pedicels 2–4 mm long (in fruits 3.0–6.5 mm long), densely patent hairy; calyx slightly flared at the limb and distinctly toothed, 2–3 mm long, calyx tube densely hairy with short straight patent hairs; calyx lobes 0.5–1.0 mm long, ovate, apiculate, keeled; corolla tube slender, dilated at throat, 8–16 mm long, about 1 mm wide at base and to 1.5 mm wide at top; corolla lobes (4–)6–7 × 2 mm, ± elliptic, obtuse; anthers 4–5 mm long; styles 2.5–3.2 cm long, glabrous, stigma pilose. Fruits 6–7 × 7–8 mm; seeds subglobose, about 4 × 4 mm.

**Specimens examined:** \* Northern Territory. Mittiebah Station (18°40'S, 137°15'E), rocky surrounds of Mitchiebo waterhole, Mar 1981, Henshall 3462 (DNA); Border Creek area (18°19'S, 138°00'E), Jan 1989, Russell-Smith 6944 & Lucas (DNA). Queensland. BURKE DISTRICT: Lawn Hill National Park, May 1989, O'Keefe s.n. (BRI); Adel's Grove via Camooweal, date unknown de Lestang 405 (BRI); Magazine Hill, 9.75 km N of Silver Star Mine (18°40'S, 138°30'E), Apr 1971, Jones s.n. (BRI); 9 miles (14.4 km) S of Riversleigh Station, Jun 1948, Perry 1448 (BRI); Lake Corella, Mary Kathleen, Jan 1958, Lavery 118 (BRI, CANB); Head of Brown's Creek (20°59'S, 139°25'E), Aug 1989, Innis 142 (BRI).

\* Northern Territory specimens (fruiting) are tentatively included here because the leaves approach those of this species. Flowering material needs to be seen to be certain.

**Distribution and habitat:** Northwest Queensland to Barkly Tableland, Northern Territory; usually in rocky areas (rocky outcrops, hillsides and gorges). **Map 5.**

**Diagnostic features:** *P. rupicola* is distinguishable by its usually narrow, hairy, shortly petioled leaves, hairy inflorescences, and by its dense spreading white hairs of the calyx and pedicels.

**Affinities:** *P. rupicola* is at first sight very similar to *P. brownii* Bremek. and *P. granitica* Bremek., but differs from the former by its usually narrower leaves which dry pale or dark brown, shorter petioles and pedicels, and usually longer corolla tubes. It can be distinguished without difficulty from *P. granitica* by its usually broader leaves ((1.5–)2.7–5.5 cm wide), and straight spreading hairs on the calyx tube.

**Etymology:** The specific epithet *rupicola*, from Latin *rupes* = rock, *-cola* = dweller, refers to the rocky habitat where this species usually grows.

**7. *Pavetta tenella* S.T. Reynolds sp. nov. *P. moluccanae* Bremek. aemulans differt foliis plerumque grandioribus latoribus, petiolis pedicellisque longioribus et plerumque pilis patentibus in calycibus. **Typus:** Northern Territory. Melville Island, Takamprimili Creek, Pickertarmoor, (11°45'S, 130°53'E), 24 Nov 1989, *P.I. Forster* 6082 (holo: BRI; iso: BRI).**

Shrubs or small trees 3–8 m high, bark light grey, fairly smooth; young parts especially young leaves, usually densely white hairy. Leaves elliptic, usually abruptly narrow at both ends, (12.0–)17.0–24.5 × (4.7–)5.5–10.0 cm, apex obtuse or abruptly shortly acuminate, base obtuse usually abruptly attenuate into the long petiole, or subacute; texture thin to ± coriaceous; both surfaces sparsely hairy, or upper ones soon glabrous or with a few hairs on the midrib only; lower ones with sparse, fine, short, ± erect hairs, or hairy only on the midrib; usually dries pale brown or pale olive-brown, very rarely infused with black; midrib prominent, broadly channelled towards the base on upper surface; lateral nerves 9–12 pairs, slender, slightly oblique or ± patent; reticulate venation very fine; petioles (1.6–)2.7–4.0 cm. Stipules connate to above middle and forming a short sheath, lobes broadly ovate, long cuspidate, prominently keeled, densely sericeous on the outside with usually short hairs or subglabrous, and with fine long collectors inside (at base). Inflorescence bearing branchlets (4.0–)6.5–18.5 cm long, covered with smooth, flaky, grey to brownish bark; inflorescences usually clustered at tips of long branchlets, 4.5–10.0 × 6.0–8.0 cm, usually very open with long branches, laxly corymbose, dries very pale brown, rarely blackish; central branch with 1 or 2 internodes, these (5–)8–27 mm long, reduced leaves often persistent at the nodes; lateral branches with 1, or rarely 2 internodes, these (6–)20–40 mm long; corymbs (lateral branch) 14–37-flowered; peduncles sparsely hairy with short, patent or sometimes ± appressed hairs; connate bracts 7–11 × 8–14 mm, ovate, dries very pale brown, ± membranous, usually densely sericeous on the outside, and with long

fine collectors inside (at base). Pedicels (8–)10–13 mm long (in fruit (10–)12–15 mm long), slender, densely patent hairy (hairs rarely appressed); calyx 2.0–2.5 mm long, calyx tube densely hairy with very fine, short, straight, spreading or occasionally appressed hairs, limb about one third the length of the tube, wider than tube, sparsely hairy, distinctly toothed; calyx lobes 0.75–1.0 × 1.0 mm, ovate; corolla tube slender, dilated towards throat, (8–)10–13 mm long, about 1.5 wide at base, 2 mm wide at the top, glabrous outside, pilose at throat; corolla lobes 5.5–6.5 × 2.0–3.0 mm, ± elliptic, obtuse or abruptly acute and apiculate; anthers 5.5–6.0 mm long; styles 2.7–3.3 cm long, glabrous or pilose towards the apex. Fruits 5.0–6.5 × 4.5–7.0 mm; seeds subglobose, 4.0–4.5 × 4–5 mm. **Fig. 2B.**

**Representative specimens:** Northern Territory. Melville Island, Jump-up Jungle, Nov 1983, *Wightman* 946 & *Dunlop* (CANB, DNA); ditto, Pickertarmoor, Nov 1989, *Russell-Smith* 8137 & *Peth* (BRI, DNA); \* 6 km S Brogden Point, Murgarella (11°34'S, 133°04'E), Mar 1987, *Russell-Smith* 1990 & *Lucas* (DNA); \* 3 km N of Magela Creek Crossing, Kakadu National Park (12°33'S, 132°34'E), Jan 1984, *Russell-Smith* 1001 (DNA)

**Distribution and habitat:** Melville Island and \* along the north coast of Arnhem Land, Northern Territory; at edge of rainforests and in vine thickets along the coast, along springs and creeks, and on sandstone. **Map 4.**

**Note:** Collections from the Australian mainland marked \* are tentatively included here, because, although the specimens are in young fruit or sterile, the leaves on them resemble those from Melville Island. Other unplaced collections from surrounding areas (including *Pavetta* sp. 1 from Cannon Hill, Northern Territory), are also probably of this taxon, but the specimens available for study are either incomplete or sterile, making their placement unsure.

**Diagnostic features:** *P. tenella* may be distinguished, by its usually large, mostly subglabrous, thin, elliptic leaves which are abruptly narrow at both ends, long petioles, and by its usually delicate looking inflorescences with long slender branches and ± filiform pedicels, and also by its very short straight spreading (occasionally appressed), very fine, whitish or very pale yellowish hairs on the calyx and pedicels.

**Affinities:** *P. tenella* is probably most closely related to *P. moluccana* Bremek. from Timor, and *P. brownii* Bremek. in Australia, with which it shares similar leaves and general aspect. It differs from both by its larger, moderately thin leaves, longer petioles, larger inflorescences, and usually longer pedicels. The type of *P. moluccana* at L and specimens of that species available for study differ from *P. tenella* in having consistently fine appressed hairs on the calyx, minute calyx lobes, shorter pedicels (4–8 mm long), shorter petioles (1.5–2.3 cm long) and narrower leaves (3.0–6.2 cm wide). *P. tenella* resembles *P. brownii* in its calyx hairs and long slender pedicels, but differs from the latter species by its usually larger, mostly  $\pm$  glabrous, thinly textured elliptic leaves which are abruptly narrowed at both ends, long petioles, and long pedicels of flowers and fruits. In *P. brownii* the leaves are usually hairier, elliptic, elliptic-oblong or subobovate, the petioles are 0.8–2.2 cm long, the calyx is indistinctly toothed, and the hairs on the calyx tube are longer.

**Etymology:** The specific epithet *tenella*, from Latin *tenellus* = delicate, refers to delicate appearance of the large inflorescence with flowers on very slender long pedicels.

**8. *Pavetta speciosa* S.T. Reynolds sp. nov.** *P. brownii* Bremek. ad spectu maxime similis, praecipue differt corollarum tubo longiore ((9–)12–16 mm longo) pilosus et pilis antrorsis leviter curvatis in calycibus.  
**Typus:** Northern Territory. Kalpalga (12°3–'S, 132°2–'E), 14 December 1976, R. Collins B.C. 146 (holo: BRI; iso: DNA).

Shrubs or small trees 1.5–5.0 m high; bark pale greyish brown; branchlets with minute spreading hairs towards their tips. Leaves obovate to elliptic-obovate, or elliptic, 6–12  $\times$  4–6 cm, apex broad, obtuse to  $\pm$  rounded, emarginate, or subacute; base subacute and decurrent into petiole;  $\pm$  coriaceous; both surfaces usually shiny, sparsely hairy, or hairy only on the midribs, or upper surfaces glabrous; usually dries brown with whitish midrib and nerves, and distinct reddish (sometimes whitish) delicate reticulate venation; lateral nerves (9–)12–18 pairs, usually conspicuous, oblique or arcuate, looping at

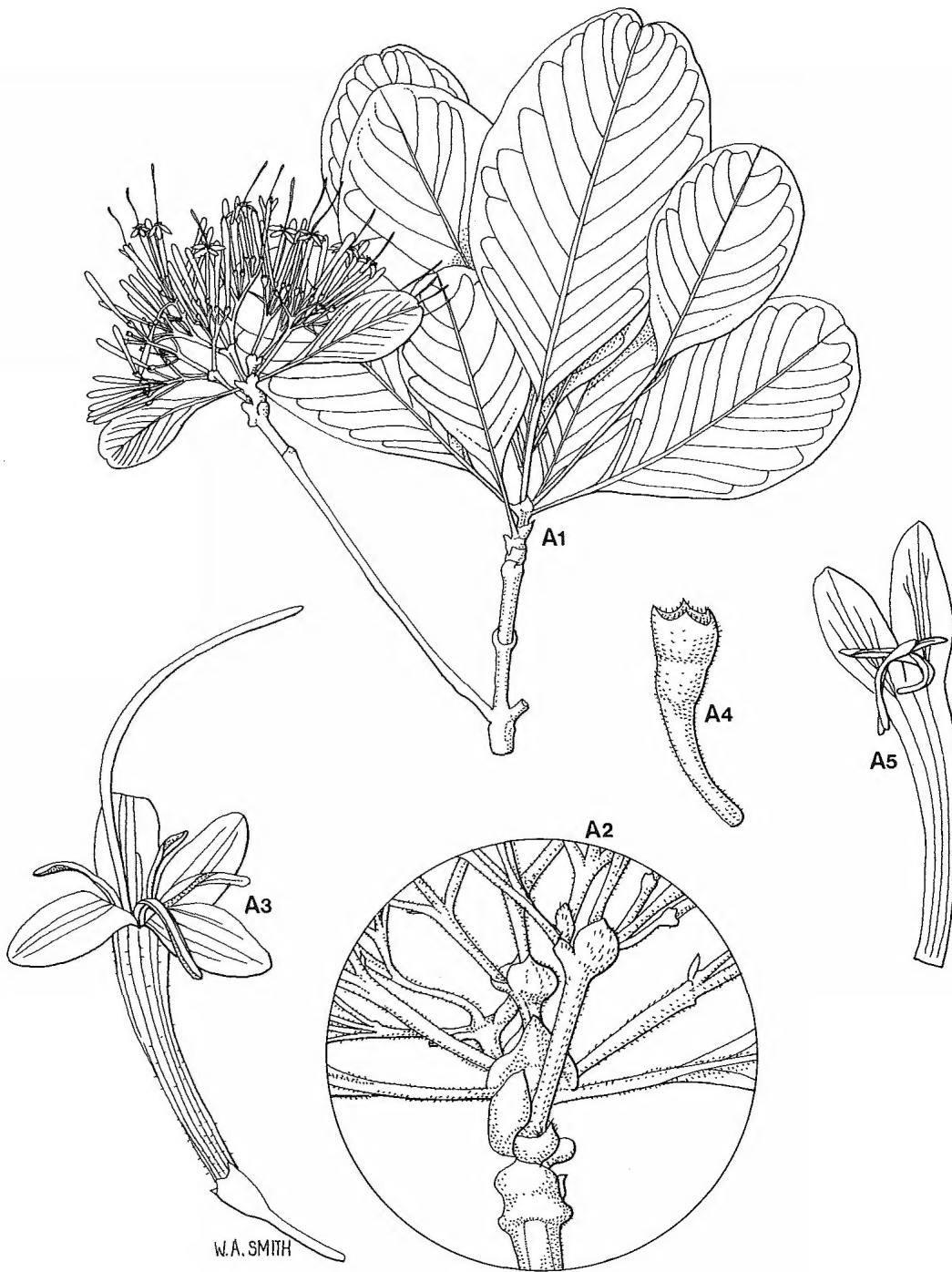
margins; petioles 0.8–2.0 cm long; stipules connate to about middle and forming a short sheath, lobes ovate, sparsely hairy on outside with very short appressed hairs, and with long colleters inside (at base). Inflorescence bearing flowering branchlets 6.5–12.5 cm long, covered with smooth greyish bark; inflorescences wider than long, 5–7  $\times$  9–12 cm, laxly or densely corymbose; central branch with 2 or 3 internodes, these 5–8 mm long; lateral branches with a (6–)8–11 mm long internode, and 18–26-flowered corymbs; peduncles sparsely hairy with antrorsely curved or  $\pm$  spreading hairs; connate bracts with broadly ovate lobes, densely appressed hairy on outside. Pedicels (4–)6–10 mm long (in fruits 8–12 mm long), sparsely hairy with  $\pm$  antrorsely curved hairs; calyx 2–3 mm long, with a very flared long limb, distinctly toothed, calyx tube with  $\pm$  dense, short, antrorsely curved or sometimes  $\pm$  appressed hairs; limb usually about two thirds of the length of the tube, much wider than the tube, sparsely hairy; calyx lobes 0.5–0.7  $\times$  0.5–0.7 mm, ovate, keeled; corolla tube slender, usually gradually dilated towards the mouth, (9–)12–16 mm long, about 1.5 mm wide at base, 2.5 mm wide at top; pilose on the outside, and at throat; corolla lobes 6.5–7.0  $\times$  2.0–2.5 mm, elliptic, obtuse; anthers 5.5–7.0 mm long; filaments about 0.5 mm long; styles 2.7–3.2 cm long, sparsely patent hairy towards apex. Fruits 6–8  $\times$  7 mm; seeds subglobose, about 5  $\times$  5 mm.

**Specimens examined:** Northern Territory. About 32 km ENE of Goodparla Station, Feb 1973, Adam & Lazarides 3097 (BRI); Kalpalga (12°39'S, 132°28'E), Mar 1982, Dunlop 6355 & Taylor (DNA).

**Distribution and habitat:** Known from the above collections, from the Northern Territory; in open forests on lateritic soil. **Map 6.**

**Diagnostic features:** *P. speciosa* may be distinguished by its large, broad, many-flowered, showy inflorescences, showy flowers with long, pilose corolla tubes, obovate to obovate-elliptic or elliptic, obtuse, subglabrous leaves with (9–)12–18 pairs of  $\pm$  oblique lateral nerves.

**Affinities:** This distinctive new species is poorly known and requires further collecting to ascertain its variability and relationships. It is nearest to *P. brownii* in its leaves and general aspect, but



**Fig. 3.** *A. Pavetta speciosa*: A<sub>1</sub>, branchlet with flowers × 0.5. A<sub>2</sub>, part of inflorescence showing connate bracts × 2. A<sub>3</sub>, flower showing hairy corolla tube × 3. A<sub>4</sub>, calyx with pedicel × 4. A<sub>5</sub>, longitudinal section of corolla × 3. Collins 146.

the latter species has a much shorter (6–11 mm long), glabrous corolla tube, indistinctly toothed calyx, elliptic or elliptic-oblong leaves which usually dry blackish, and fewer pairs (8–10 pairs) of lateral nerves.

**Etymology:** the specific epithet *speciosa*, from Latin *speciosus* = showy, splendid, refers to the showy inflorescence and flowers.

**9. Pavetta conferta** S. T. Reynolds **sp. nov.** inter *P. brownii* Bremek. et *P. muelleri* Bremek. quasi intermedia, ab ambobus inflorescentiis compactis, confertifloris, ramulis floriferis brevioribus differt, a *P. brownii* haud aegre distinguitur pedicellis brevioribus, calycis lobis conspicuis et corollis plerumque longioribus; differt a *P. muelleri* pilis brevioribus appressis in calycibus, et foliis plerumque paucinerviis. **Typus:** Northern Territory. Gunn Point (12°09'S, 131°03'E), 9 November 1978, *M.O. Rankin* 1564 (holo: DNA; iso: CANB).

Shrubs or small trees 1.5–4.0 m high, branchlets with short, appressed or ± antrorsely curved fine hairs towards their tips, lenticellate. Leaves elliptic or subobovate, 10.5–13.0 × 4.0–6.0 cm, apex obtuse or ± rounded, base obtuse or subacute; both surfaces sparsely hairy, or upper surfaces subglabrous, slightly glossy and obscurely gland-dotted; usually dries brown; lateral nerves 8–10 pairs, slightly oblique; petioles 0.6–1.2 cm long, sparsely hairy; stipules united below the middle and forming a short sheath, lobes broadly ovate, cuspidate, and with a slightly membranous margin, densely appressed hairy on the outside. Inflorescence bearing branchlets 8–11 cm long, covered with smooth greyish-brown bark; inflorescences one to few, clustered at tips of branchlets, 2–7 × 5–15 cm, usually wider than long, depressed from the top and compacted, with reduced central axis, and very short branches, central branch with 1 or 2 internodes, these 3–5(–7) mm long; lateral branches with a 2–7(–12) mm long internode, and 9–18-flowered corymbs; peduncles finely appressed hairy; connate bracts united to above middle, usually densely appressed hairy outside, and with fine long colleters inside (at base). Pedicels (4–)6–8 mm long, densely

hairy; calyx about 2 mm long, with a slightly flared, ± membranous limb, distinctly toothed; calyx tube with dense, short, appressed or ± antrorsely curved hairs, the hairs very sparse on the limb; calyx lobes about 0.5 × 0.5 mm, ovate; corolla tubes 7–11(–13) mm long, slightly dilated at mouth, about 1.5 mm wide at base and to 2 mm wide at mouth, glabrous outside; corolla lobes 5.0–6.0 × 2.0–2.5 mm, elliptic, obtuse; anthers 4.5–5.5 mm long; styles 2.5–3.2 cm long. Fruits not seen.

**Specimens examined:** Northern Territory. Koolpinyah (12°21'S, 131°09'E), Oct 1974, *Dunlop* 3664 (DNA); 3 km NW Woolaning (13°05'S, 130°39'E), Oct 1988, *Russell-Smith* 5956 & *Lucas* (DNA); Near Florence Falls (13°07'S, 130°49'E), Oct 1984, *Silverisen* 961 (DNA).

**Distribution and habitat:** Known only from the above collections from Northern Territory; in low woodlands on sandy lateritic soil.

**Diagnostic features:** *P. conferta* is characterised by its compact inflorescences with short branches and a reduced central axis, by its short pedicels, short, appressed to antrorsely curved hairs on the calyx tube, small calyx lobes, glabrous, long corolla tubes (7–13 mm long), and by its elliptic to obovate leaves with a few pairs (8–10 pairs) of lateral nerves.

**Affinities:** This species is known only from the above rather poor collections. It appears to be intermediate between *P. brownii* Bremek. and *P. muelleri* Bremek. differing from both particularly by its compact, shortly branched inflorescences which are ± depressed on top. *P. brownii* may be distinguished from this species by its inflorescence with moderately long open branches; its longer pedicels ((4.5)6–12 mm long); its indistinctly toothed calyx; and by its dense, straight, patent to ± appressed hairs on the calyx tube. *P. muelleri* differs by its larger, elliptic to subobovate, glossy leaves, with a greater number of lateral nerves (12–14 pairs), by its shorter pedicels ((0.5–)2.0–3.0(–7.0) mm long) and by its longer, ± curly, appressed hairs on the calyx tube. However, more collections (especially flowering material) of *P. conferta* are necessary to establish that the above differences are consistent, and to assess its relationships with other species, viz *P. speciosa* and *P. vaga*, which occur in the area.



**Etymology:** The specific epithet *conferta*, from Latin *confertus* = pressed close together, crowded, densely, refers to the crowded flowers in the inflorescence.

**10. *Pavetta vaga* S.T. Reynolds sp. nov. *P. brownii* Bremek. per similis autem differt corollae tubo multo longiore (12–14 mm longo) pilosos, corollae lobis plerumque acutis, calycis lobis conspicuis, bracteis connatis ± velutinis, et petiolis longioribus. **Typus:** Northern Territory. Humpty Doo, 10 February 1961, *H.S. McKee* 8362 (holo: BRI; iso: DNA; NSW).**

Shrubs or small trees 1.5–4 m high; branchlets with minute, ± curved, spreading or ± appressed hairs towards their tips, lenticellate; young leaves ± sericeous on lower surfaces. Leaves elliptic to subobovate, (6–)9–15 × 4–6(–7) cm, apex obtuse, ± rounded, or subacute apiculate, base obtuse or subacute; ± coriaceous; both surfaces hairy, or upper surfaces subglabrous, lower ones densely to sparsely hairy, especially on the midrib and nerves; usually dries brownish with pale midrib and nerves; lateral nerves 9–12 pairs, slightly oblique or ± arcuate and looping at margins; petioles 0.8–1.5(–2.5) cm long, sparsely hairy to subglabrous; stipules united nearly the whole length and forming a long, truncate sheath, or with small, cuspidate lobes, densely hairy on outside with short hairs, and with fine dense colleters inside (at base). Inflorescence bearing branchlets 7.5–11.0 cm long, covered with brownish-grey, smooth, flaky bark; inflorescences loosely branched, many-flowered; central branch with 1 or 2 internodes, these 5–15 mm long; lateral branches with a usually long (10–30 mm long) internode, and with (9–)15–18-flowered corymbs; peduncles with minute, ± curved, spreading or slightly appressed hairs; connate bracts united to above middle, with broadly ovate lobes, densely hairy with short appressed hairs and ± velutinous. Pedicels 6–8 mm long (in fruit 8–12 mm long), densely hairy, with short, antrorsely curved or sometimes ± reflexed hairs; calyx 2.0–2.5 mm long, with a long much wider flared limb, distinctly toothed; calyx tube densely hairy with thick, short, antrorsely curved, or ± spreading hairs, the hairs much sparser on the limb; limb about half as

long as the tube; calyx lobes 0.5–0.7 × 0.5–0.7 mm, broadly ovate; corolla tube 12–14 mm long, dilated towards the mouth, about 1.5 mm wide at base and about 2 mm wide at top, usually pilose outside and at throat; corolla lobes 6.0–7.0 × 2.0–2.5 mm, lanceolate or elliptic, acute or obtuse; anthers 5.5–7.0 mm long; filaments about 0.5 mm long; styles 2.7–3.0 cm long, pilose. Fruits about 5 × 5 mm.

**Specimens examined:** Northern Territory. Humpty Doo (12°38'S, 131°15'E), Feb 1961, *McKee* 8362 (BRI, DNA, NSW); ditto, Jan 1963, *Muspratt* SS 0304 (DNA); 30 miles [48 km] from Darwin, Nov 1921, *Allen* 542 (DNA); Darwin River Quarry area (12°49'S, 130°59'E), Nov 1978, *Rankin* 1590 (DNA); Darwin River Region, Labersheda (12°51'S, 130°59'E), Oct 1986, *Brock* 160 (DNA).

**Distribution and habitat:** Known only from the above collections from near Darwin in the Northern Territory; in open forests on lateritic soil.

**Diagnostic features:** *P. vaga* may be distinguished by its ± velutinous connate bracts which are united to above middle, by its long usually pilose corolla tubes, acute or obtuse corolla lobes, and by its dense, antrorsely curved hairs on calyx tube, prominent calyx lobes, and also by its hairy elliptic leaves on usually long petioles.

**Affinities:** *P. vaga* is poorly known. It is probably closely related to *P. brownii*, *P. speciosa* and *P. conferta*, and the species are doubtfully distinct but until better known they are kept distinct because of the differences indicated below.

The new species is most similar to *P. brownii* from which it differs by its longer, hairy corolla tubes; its longer, usually acute corolla lobes; by its distinctly toothed calyx; and its conspicuous ± velutinous connate bracts. In *P. brownii* the connate bracts are ovate, thin, densely hairy with long white appressed hairs (outside), the calyx is indistinctly toothed, the calyx tube has straight patent or ± appressed hairs, and the corolla has a shorter (6–11 mm long) glabrous tube, and shorter (4.5–6.0 mm long) obtuse corolla lobes. *P. conferta* differs from *P. vaga* by its compact inflorescences with short branches, short appressed or antrorsely curved hairs on calyx tube, and by its shorter petioles. *P. speciosa* differs from *P. vaga* by its

showy flowers with longer ((9–)12–16 mm long), usually wider corolla tubes, obtuse corolla lobes, and by its usually subglabrous, obovate to elliptic-obovate leaves which dry brownish with distinct, oblique to patent nerves and delicate conspicuous, ± reddish reticulate venation.

**Etymology:** The specific epithet *vaga*, from Latin *vagus* = uncertain, refers to the status of this species compared to other closely related species.

### Imperfectly known taxa

A few rather distinct but poorly known taxa which cannot be satisfactorily placed in any of the recognised species have been segregated. Three of these which appear to be distinct species are described below. They are not formally named here because specimens seen are too few, incomplete or immature to be sure.

#### *Pavetta* sp. 1

Small trees to 5 m high; branchlets with very short sparse hairs towards their tips. Leaves narrowly elliptic, lanceolate or ± oblanceolate, sometimes subobovate, apex acute or obtuse, base obtuse or subacute and attenuate into the petiole, 12.5–18.0 × 4.8–5.5 cm, both surfaces ± subglabrous with only a few hairs on the midrib, or upper surfaces glabrous, texture thin; midrib narrowly channelled towards the base on upper surfaces; lateral nerves 9–12 pairs, ± oblique and ascending; reticulate venation finely and loosely arranged; petioles 1.8–2.5 cm long, puberulent; stipules shortly connate, ± truncate, with small keeled lobes, or connate above middle and forming a short sheath and with ovate cuspidate keeled lobes, sparsely short hairy on the outside. Inflorescence bearing branchlets 2.5–6.5 cm long, covered with pale grey smooth bark; inflorescences laxly corymbose; peduncles with sparse, short, fine, ± curved appressed or antrorsely curved hairs; central branch with 1 or 2 internodes, these 10–20 mm long; lateral branches with one internode about 15 mm long (30–32 mm long in fruiting specimens); lateral corymbs 7–18-flowered; connate bracts sparsely hairy on the outside; pedicels slender, 8–12 mm long (in buds and fruits), puberulous; calyx (buds) with dense short fine appressed hairs, the

hairs thinning out towards the limb, lobes ovate; corolla tubes (buds) 5–6 mm long, pilose outside; lobes just as long. Fruits about 7 × 6 mm, puberulent.

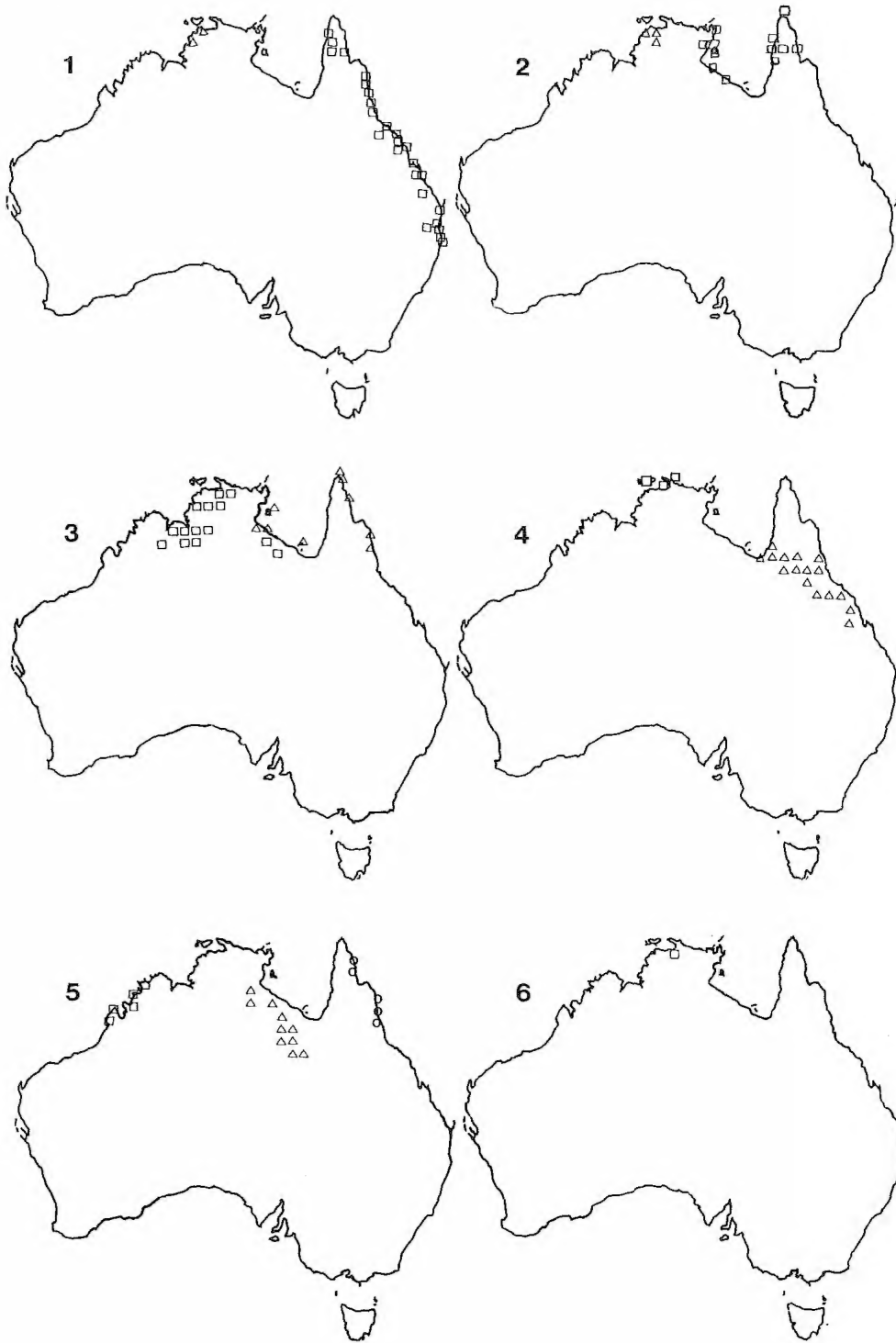
**Specimens examined:** Northern Territory. Cannon Hill, Dec 1972, *Byrnes* 2947 (DNA); 7 km NNW Cannon Hill Airstrip (12°17'S, 132°54'E), Jul 1983, *Russell-Smith* 782 (DNA); 13 km S Cannon Hill, Dec 1983, *Russell-Smith* 909 (CANB).

**Distribution and habitat:** Around Cannon Hill, Northern Territory, in sandy lateritic soil.

**Diagnostic features:** This taxon which is known from a few rather poor collections (in young fruit or in bud), is characterised by long narrow elliptic or lanceolate leaves, few lateral nerves, long petioles and long stalked buds and fruits. It resembles *P. speciosa* and *P. tenella* in its general aspect, and is probably closely related to these species, but more collections (preferably flowering specimens) are necessary to be certain.]

#### *Pavetta* sp. 2

Multistemmed shrubs or small trees to 4 m; bark grey ± stringy; younger parts, leaves, inflorescence axes and calyces densely hairy with long, fine, curly or ± crispate hairs; young branchlets with short spreading or ± antrorsely curved hairs. Leaves narrowly elliptic or lanceolate, usually wider above the middle, 7.0–14.5 × 2.3–5.0 cm, apex ± subacute or obtuse, rarely very shortly acuminate, base obtuse or acute and shortly decurrent into the petiole; both surfaces hairy, the hairs denser below, upper surfaces with ± erect hairs, lower ones with dense, fine, long curved or ± crispate, white hairs; slightly coriaceous, dries pale brown or dark brown; midrib usually flattened above; lateral nerves 7–9(10) pairs, ± arcuate, usually ascending at their tips; petioles 0.7–1.5(–2.0) cm long; stipules densely hairy outside. Inflorescence (infructescence) wider than long, about 4.5 × 8.5 cm, compact with short branches, central branch with 2 or 3 internodes, these 5–7 mm long; lateral branches with one internode 15–25 mm long; lateral corymbs 9–19-flowered; peduncles densely hairy; pedicels (only old flowers seen) 1–3 mm long (in fruit 5 mm long); remnant calyx with a very flared limb, about 1.5



**Maps 1-6.** Distribution of *Pavetta* spp. 1. *P. australiensis* var. *australiensis* □, *P. conferta* △. 2. *P. brownii* var. *brownii* □, *P. vaga* △. 3. *P. muelleri* □, *P. brownii* var. *glabrata* △. 4. *P. granitica* △, *P. tenella* □. 5. *P. australiensis* var. *pubigera* ○, *P. kimberleyana* □, *P. rupicola* △. 6. *P. speciosa* □.

mm long, calyx tube densely hairy with short, antrorsely curved or appressed hairs, limb much wider than the tube and about half as long, sparsely hairy, distinctly toothed; calyx lobes ovate. Young fruits puberulent.

**Specimens examined:** Western Australia. Drysdale River National Park, near Morgan Falls (15°02'S, 126°40'E), Aug 1975, *George* 14048 (PERTH); ditto, Ashton Range, (15° 16'S, 126°43'E), Aug 1975, *George* 13289 (PERTH); 16 km E of Bungle Bungle Outcamp East (17°13'S, 128°26'E), *Kenneally* 9210 (PERTH); Prince Regent River, 1891, *Allen* s.n. (MEL 1553924).

**Distribution and habitat:** Northeast Kimberley, Western Australia, in the above localities; in sandstone scree slopes and siltstone scarps in open woodlands.

**Diagnostic features:** This taxon known only from the above few sterile and poor fruiting specimens, is characterised by its hairy fairly narrow leaves on long petioles. It appears to be resemble both *P. kimberleyana* S.T. Reynolds and *P. muelleri* Bremek. in its general aspect and hairiness, but differs from both by its narrow, long petioled, hairy leaves. More collections (preferably flowering material) are necessary to assess its variability and relationships.

### *Pavetta* sp. 3

Shrub or small tree. Leaves and inflorescence hairy. Leaves elliptic, 8.5–11.0 × 4.0–5.2 cm, obtuse or subacute at apex and base, upper surfaces sparsely hairy, gland-dotted, lower ones densely hairy; dries brown; lateral nerves 10–12 pairs, ± arcuate; petioles 1.0–1.2 cm long; stipules connate below middle and forming a short sheath, and with broadly ovate keeled lobes, hairy on outside with very short appressed hairs. Inflorescences many flowered, connate bracts thin, densely sericeous on the outside; pedicels (3–)6–8 mm long (unequal in length in the cymule, and thick in bud); calyx about 2 mm long, distinctly toothed, densely hairy on both calyx tube and limb with antrorsely curved to ± spreading, or appressed hairs, calyx lobes broadly ovate, 1 mm long, sparsely hairy; corolla tube 12–14 mm long, slender, dilated at mouth, glabrous outside; corolla lobes about 6.0 × 1.5–2.0 mm long, elliptic, obtuse; styles 2.7–3.3 cm long.

**Specimens examined:** Northern Territory. Settlement Creek, Dec 1922, *Brass* 245 (BRI, NSW); Redbank Mine, Wollgorang Station, Nov 1984, *Thompson* 764 (BRI, NSW); Borrooloola, Nov 1911, *Hill* s.n. (MEL 1537277).

**Distribution and habitat:** Along the Gulf of Carpentaria, Northern Territory, in rocky areas e.g. wet rocky gully or amongst rocks.

**Diagnostic features:** This taxon known from a few poor specimens (with immature leaves and inflorescences) is characterised by its hairy elliptic leaves, dense antrorsely curved, ± spreading or appressed hairs on the calyx, distinct calyx lobes and long corolla tubes. It resembles both *P. muelleri* and *P. brownii*. It has the distinctly toothed calyx, and short, unequal and usually thick pedicels of the buds of the *P. muelleri*, and the leaves and ± the calyx hairs of *P. brownii*, but differs from both these species in its long corolla tubes. More specimens (preferably good flowering material) are needed to assess its variability and relationship with the above species.

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